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Electrical World

The consolidation of Electrical World, Electrical Engineer and American Electrician
Published by McGraw-Hill Company, Inc.

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Volume 76 New York, Saturday, October 23, 1920 *Number* 17

Public Utility Bonds

BANKERS report a remarkable improvement in the demand for public utility bonds. This is in keeping with the present firm tone of the bond market and, to use a stock market expression, indicates a gradual change from bear to bull. The bear argument that public utilities are limited to a fixed rate for a service which they now render at prohibitive cost is, of course, untenable in the light of recent advances allowed to the railroads by the Interstate Commerce Commission and to the local public utilities by the public service commissions. The utilities are therefore gradually increasing their earnings and restoring their impaired credit. Hence the attractiveness of utility stocks and bonds, particularly when the price of money and commodities is on the decline, presaging lower operating costs with correspondingly greater earnings.

The Automobile Slump

OVER-EXPANSION, credit restrictions and general reaction of business have brought the automobile industry face to face with a readjustment. At the present time production has fallen off approximately 50 per cent, so that this year the aggregate output of pleasure and business cars in this country is estimated at 1,500,000, compared with 2,000,000 last year. The extent to which manufacturers of electrical apparatus are affected by industrial crises in industries other than their own is not always appreciated. A moment's reflection will show that there is a great deal of electrical apparatus on a gasoline car. The storage battery, self-starter, lighting and ignition equipment involve, on a very conservative basis, an outlay of $50 by the automobile manufacturer, so that the drop in production of automobiles this year as compared with last represents a loss to the electrical industry of more than $25,000,000. Fortunately, manufacturers of electrical equipment have been so overloaded with business that this loss, formidable as it is, has hardly been noticed.

Service Ideals in Danger

THE electric light and power industry has prided itself, and justly so, on the high character of its service. To furnish that service has involved the building up of splendid organizations whose loyalty and fidelity have played a major part in achieving results. These organizations, however, are now facing danger due to continued attempts to accomplish more than is humanly possible. The calmness with which service troubles are accepted is but one indication. The continued strain of keeping plants operating without adequate equipment and with little hope of securing it cannot be borne indefinitely without a loss of morale and a consequent lowering of service ideals. Service may be restored in time by the installation of new equipment, but it will be a much harder task to recover that intangible thing which has been the prime factor in building up the service ideal—morale. Therein lies the danger.

Connected Load Inventories

TO DETERMINE more than approximately the total connected load on a normal good-sized central-station system at a given moment is a task of burdensome cost. One would find it almost as easy to conduct a census of the number of people on a stated mile of Broadway at a particular hour of a business afternoon. Yet connected load data are very illuminating when subdivided and used to determine the unit revenue and cost of different kinds of service. The industry does not know today how far it pays to spend time and money in taking connected load inventories. Something better than a yearly compilation of data based largely upon guesswork is clearly needed, for without well-defined limits of accuracy the statistical analysis of such information may lead the central-station manager to follow after strange gods. A beginning can at least be made by surveying the larger industrial installations minutely and establishing card-index records, to be periodically checked and brought fairly well up to date. Classified groups of residential and other commercial customers' installations can then be studied, and it may prove in time possible to limit such surveys to areas where the totals obtained by multiplying group statistics by population or geographic factors can be relied upon sufficiently to illuminate and guide different executive policies in the extension and conduct of service.

The Small Utility

THAT there is some dissatisfaction with commission regulation it is useless to deny—not that regulation has fallen down, but because the public does not fully understand. For example, the entire New Jersey commission has just been dismissed because of neglect of duty and misconduct in office. That in itself may mean nothing. As a reason for executive action it will suffice. However, discrimination against the smaller and less influential utilities is charged, and discrimination of any kind is repugnant. Now, there is none more prone to suspicious imaginings than the unsuccessful or unfortunate. Discrimination in New Jersey there probably was, because where there is much smoke there must be some fire; but that it ever became flagrant is hard to believe. What is believable is that the smaller companies have received little consideration from their bigger brothers and have had to shift for

themselves. They are, therefore, more or less out of touch with matters concerning them vitally, since they neither join organizations of their kind nor observe the trend of the times. As a chain is no stronger than its weakest link, the result is obvious. It is unwise to permit these small properties to hover between life and death for want of help and guidance. Not only must regulation be an open book to them, but the engineering knowledge and experience of more successful companies should be at their beck and call. Approximately 90 per cent of the electric light and power plants of the country are rated at 2,500 kw. and under. Small plants are, therefore, the rule and not the exception. Their managers are molders of public opinion and as such contribute an element of strength to the industry. Every effort should for that reason be made to educate them in the economics of the electric light and power business, not only for their own good but also for the good of the cause.

Alternating Currents for Submarine Cable Transmission

IN THE ordinary operation of long submarine-telegraph cables the signaling is carried on by a sort of mixture of direct-current and alternating-current methods. It is not strictly a direct-current method, because, although a voltaic battery is the customary source of emf., the applications of polarity are frequently reversed. It is likewise not strictly an alternating-current method, because the successive reversals do not occur in orderly succession. Hence there are two rival schools of engineering philosophy in dealing with the very practical subject of the speed of signaling over cables. One school insists that the attack shall be made entirely by the direct-current method, using direct-current arrival curves superposed *ad infinitum*, each new one upon the backs of all its predecessors. The other school insists that the attack shall be made entirely by the alternating-current method as fundamental basis, and that the alphabetical departures from the sober alternating-current régime shall be treated as incidental deviations to be dealt with empirically. The first method is rigidly correct, but extremely difficult to interpret. The second method is very easy to apply, but the extent of its error is somewhat uncertain. Prudence dictates respectful attention to both parties; *i.e.*, utilizing the simplicity of the one and checking the results by rigid deductions from the other.

Whatever opinion may be held as to the relative merits of these two rival schools of submarine-cable theory, there can be little doubt that the future of the theory and practice rests mainly on the alternating-current side. It is much the easier, the more pliant and the more comprehensive. For these reasons an experimental study of submarine-cable circuits by alternating-current methods is very desirable and has long been overdue.

In the last number of the *Journal* of the Franklin Institute the Chief Signal Officer communicates an interesting series of alternating-current measurements, by Dr. F. E. Pernot, on the Sitka-Seattle cable, followed by tests indicating that multiplex alternating-current signaling methods could satisfactorily be executed on this type of cable, at least up to a length of 700 km.

The measurements of linear resistance indicate that the apparent linear resistance of the conductor, instead of being a fixed quantity at a fixed temperature, as is ordinarily assumed, actually increases nearly 50 per cent between 0 cycle and 1,300 cycles, while at the same time the apparent linear inductance falls from 1.2 millihenries to 0.8 millihenry per kilometer over the range of frequency between 200 cycles and 1,300 cycles. On the other hand, the linear capacitance does not change greatly over this frequency range. The linear leakance, however, rises from about zero to 130 micromhos per kilometer, nearly according to a straight-line law with this frequency increase, or about 0.1 micromho per kilometer per cycle per second. The result is that in this type of cable the attenuation constant, or real part of the linear hyperbolic angle, increases as the four-tenths power of the frequency, instead of the five-tenths power, or square root, ordinarily assumed.

These results are of great technical importance in various ways. In the first place, they indicate that as the impressed frequency rises the return path of the alternating currents through the "ground" is not spread out so widely through the ocean and land as it is believed to spread with direct-current application, but concentrates its current density toward the vicinity of the insulated conductor. Consequently, the steel armor inclosing the core carries much more of the return current everywhere along the cable than it would carry at the very low existing signaling frequencies of a few cycles per second. This concentration of the return current toward the neighborhood of the cable increases the apparent conductor resistance as the frequency rises. It is even possible that the hysteretic loss in the steel armor wires of the cables may be an appreciable element of extra resistance in deep water, whereas it has hitherto been supposed that only at close to the shore terminals would the density of return current in the sheathing be likely to effect appreciable magnetic reversals and hysteretic loss.

It is important that these measurements and tests should be repeated and studied carefully on a number of different types of cable.

The Part of the Investment Banker

IN RECENT issues of the ELECTRICAL WORLD two more than usually significant addresses have been printed. In the first of these a representative of a utility-operating company appealed to large consumers of electricity to help finance the public service companies on which they depend for their power. In the second a representative of the investment bankers, speaking to central-station managers, dwelt on the principles of sound financing to which these managers should adhere. This week we print in part a third address, by Carl D. Jackson of the Wisconsin Railroad Commission, in which the chairman of that very influential body speaks of the functions of the investment bankers in relation to public utilities. There is no conflict between these three expressions of opinion. On the contrary, they might almost be said to form together the boundaries of an argument which, like an equilateral triangle, has its sides and angles equal and in perfect correspondence. Mr. Jackson emphasizes the point that just as utility regulation cannot be successful without the aid of utility managers, neither can it in the long run be successful without the sympathetic co-operation of investment bankers. These bankers he conceives as being not mere "security

merchandisers" but something more important and responsible. Vested in them is the "quasi-public duty" of assisting the commissions to bring about a sound financial basis for the public service corporations of the nation. We are sure that all investment bankers worthy the name, so far from desiring to shirk this obligation, will recognize it as one which they must fulfill both to maintain the high standards of their calling and to lay a permanent foundation for their own prosperity.

The Oregon Industrial Lighting Code

OREGON is to be congratulated on the adoption of the lighting code, some account of which is given in another column. Like other codes, it is based on the Illuminating Engineering Society's code of 1917, but it includes some needed improvements regarding intensities. The amount of light required for all the varied operations of manufacture can never be fully classified and much must necessarily be left to the judgment of inspectors. Besides, it appears from recent studies that the I. E. S. minimum values on the whole tend to run too low. Constant work under illumination insufficient to bring the eye to the full powers required for the task at hand is adjudged by most ophthalmologists likely to prove injurious, and while the minimum code values are in some instances sufficient, others in the same nominal class are far too low. The range of the I. E. S. code for manufacturing operations from 1.25 foot-candles to 5 foot-candles is rather small. It needs to be extended at both ends. There are operations in rough handling and working of crude stuffs which may not require the lower figure, and there are certainly others, like engraving work and embroidering on black goods, for which much more than 5 foot-candles is required.

The departures in the Oregon code are in the right direction, we are glad to observe. The most notable one is the requirement of 0.5 foot-candle as general illumination. The usual figure is just half this. Perhaps it would be better to make the general lighting at least a certain proportion of the required minimum, and certainly the Oregon figure is the better one for the higher classes of manufacture. The chief difficulty in the application of any code is the allotment of operations to their proper classes, and for this the inspector, if experienced and of good vision, can have no safer guide than the motto, "Put yourself in his place."

Unit Layout of Plants Reduces Complication

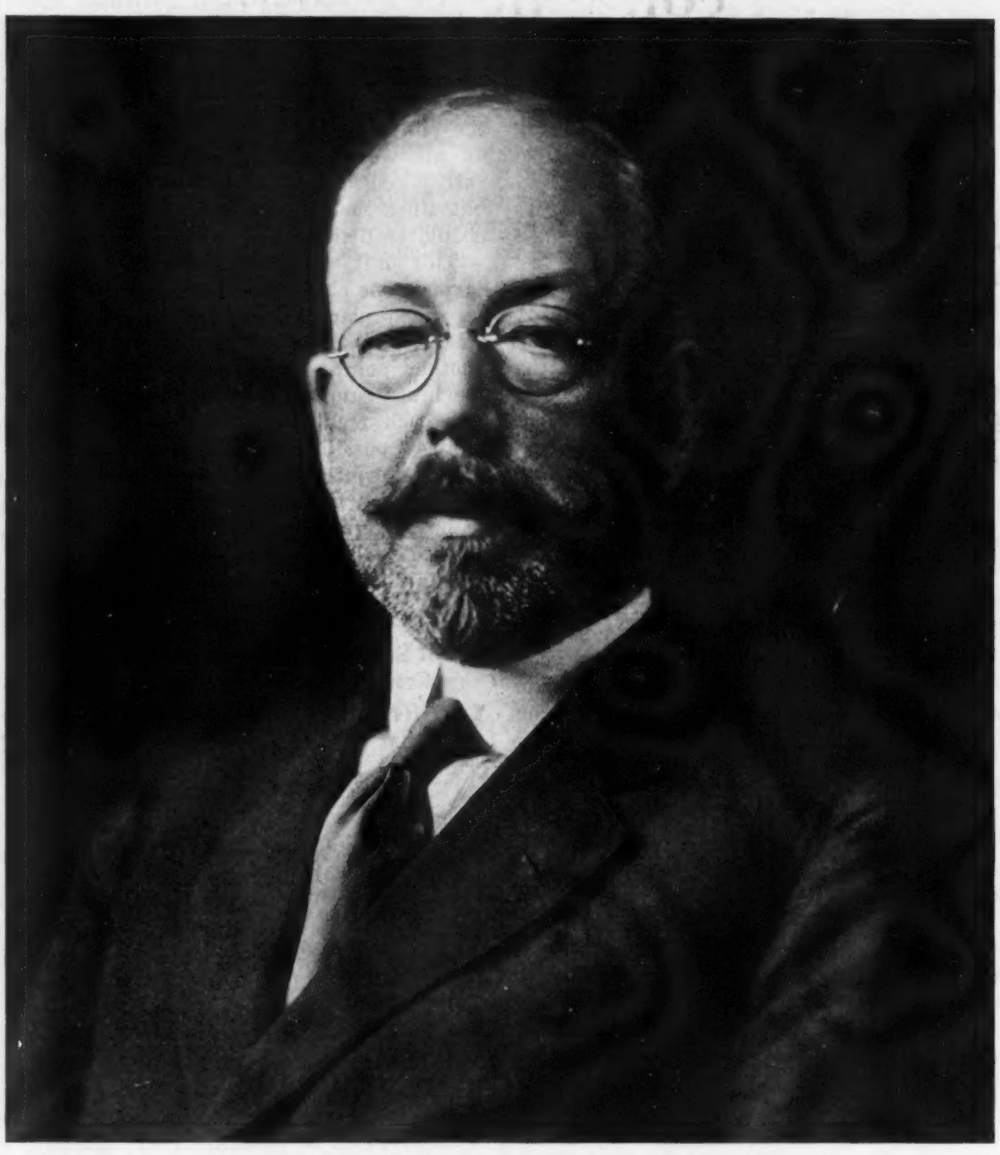
THE general arrangement of the 100,000-hp. station extension of the Niagara Falls Power Company embodies a unit scheme of operation which should be more widely used than it is. Each of the three 32,500-kva. generators may be considered as arranged to form a power plant by itself, the connection and auxiliaries being placed in a perfectly symmetrical way with respect to their several generators, which operate, however, so far as the external circuits are concerned, each as an individual. The main substation at which the paralleling is done is three miles distant, and each generator feeds to that substation over entirely independent lines controlled by individual switches, so that they function in fact like three independent plants although within the same power house. This is a wise step when such big units are concerned, and it leads both to a simplification of switching apparatus and to lessened likelihood of breakdown. The operators in the power house proper are simply concerned with stopping and starting the generators, while the control is carried to a separate control house at the top of the cliff where the operator can sit quietly and carry on his work. This arrangement compels the use of rather long cables between generators and switchboard, but since the former are automatically protected there should be little likelihood of trouble.

This unit arrangement strikes us as a very advantageous one since there is no reason why an adequately protected plant directly united to a proper switching station should have duplication of switchboard at another point. It is merely necessary to keep these machines running properly through the control station and each feeding into the substation's supply in the simplest possible manner. In the same way, where step-up transformers are used, each generator with its transformers can be considered as a single independent unit to be treated as a whole. Simplicity is greatly to be desired in electrical plants big and little, and to this the unit idea very directly leads.

Rural Service a New Central-Station Problem

WHAT is the meaning of the rural service problem that is pressing particularly in the Middle Western States? This is a question that central-station managers cannot afford to dodge. In this issue an article points out the line of thought that an extensive investigation indicates as the one which the central-station industry should be pursuing. Except in those sections where the problem has actually become pressing, the dominating nature of other problems has given central-station men a tendency to treat the rural service problem as a fad. The men who have had it forced on their attention, and have taken the trouble to investigate carefully, view it as having a basis in the economic advantage gained by the farmer in using electric service. If this view is accurate, the central station cannot escape finding a solution. To a greater extent than in other fields of central-station activity, the problem is one of sale of service. Because of experience in territory where the sale of energy is large enough in volume to absorb the service feature in large measure, it is difficult to view the rural service problem in its proper light, since the service factor due to the present relatively small sale of energy is a dominating factor which necessitates a reversal of the usual order of thinking.

The question to be faced is whether the farmer can afford to pay for the service he secures, though that service measured in kilowatt-hours may be insignificant as compared with the service in other fields. Two thousand farm consumers estimated to be connected this year in Wisconsin, 600 of whom are on one system alone, indicates that the demand is not a fad. In cold cash expense borne by the farmers the investment in lines alone, it is believed, will exceed $500,000 and may total nearer $1,000,000. This is only one state, and the problem is active in more than half a dozen states. Central-station managers cannot afford to ignore the situation. It is acute in a few states and may soon be acute in many others.



Samuel Everett Doane

Whose early vision of the future of the lamp industry and conception of the factors involved in selling illumination have been largely instrumental in laying the foundations of a new era in lighting

CLOSE application to his work, long hours and constant study, combined with engineering foresight, are accountable for the steady progress of S. E. Doane from the status of office boy to Elihu Thomson and E. W. Rice back in 1886 in the old Thomson-Houston Company in Lynn, Mass., to that of chief engineer of the National Lamp Works of the General Electric Company and one of the outstanding figures in the field of artificial illumination. A dreamer he is, but a dreamer of the practical kind with the enthusiasm and the energy to make his dreams come true. He was among those who early saw that lamp manufacturers must make their chief effort that of selling illumination rather than lamps. In conformity with this idea he developed the now well-known engineering bulletin which gives complete technical information without selling or commercial data.

When the tungsten lamp first was brought out with an energy consumption a third that of the carbon lamp, Mr. Doane foresaw the serious effect it would have on central-station revenues unless there were developed a more logical rate structure which would recognize the fixed charges and thereby protect the industry from being crippled financially by advances in the art or by changed conditions. There naturally followed the rate research committee of the N. E. L. A., of which Mr. Doane was for many years a member. As the result of an intimate study of European wiring practice he advocated a less expensive method of wiring houses in order to make electric light available in the most humble homes. He felt that, even if the wiring were not up to the highest standards, still it would be safer than the open-flame lamps which he sought to displace. He has been a stanch and consistent advocate of standardization ever since he entered the industry. When a young man he voiced the need for a body which would establish standards for the entire country. This necessity was argued in a paper read before the A. I. E. E. at that time, and after the discussion an Institute committee of older men was appointed which in a certain measure was responsible for the establishment of the Bureau of Standards. He was also active in the campaigns for the standardization of lamp voltages, bases and bulbs. For some time Mr. Doane has contended that a closer study of industrial illumination would reveal startling results. Justification of this opinion is found in the recent demonstrations at Nela Park and elsewhere in connection with higher intensities on the working plane.

Mr. Doane was born at Swampscott, Mass., Feb. 28, 1870, with all the traditions of a Mayflower ancestry. He is a member of most of the national electrical associations and has worked on many committees. During the past year he has spent considerable time performing the duties of president of the Illuminating Engineering Society and making plans for the rebuilding of the society into one of considerable proportions.

Demand for Rural Service Based on Economic Reasons

Central Stations Must Face Problem of Providing Service—Financing Because of Present Situation Should Not Blind Central Stations to Future—Forms of Rate Schedules—Education of the Farmer Necessary

THE FINANCING OF RURAL EXTENSIONS LIKE THIS MUST BE CONSIDERED FROM CONSUMERS' VIEWPOINT IF THIS MARKET FOR POWER IS TO BE DEVELOPED AS EXTENSIVELY AS IT MAY BE

WHAT is the meaning of the demand of rural line extensions which, in some sections of the country, is so strong that farmers are even willing to build and turn lines over to the central station without return other than the securing of service? Is it a fad that will die out in time, or is there an economic reason on which the demand is based? These two questions need thorough consideration on the part of central-station managers, who cannot afford to let themselves be blinded, by other difficulties, to the fact that there is a growing movement looking toward electric service to the farms. Prof. A. R. Sawyer of the Michigan Agricultural College told the Michigan Section of the National Electric Light Association at its recent convention of the work being undertaken by the agricultural college to better farm-living conditions, make the farmer a better business man, and consequently a more useful member of society. That electric power will play the same relative part in this work it has played in the development of the industrial world was his belief, based on careful investigation of Michigan conditions. Personal contact with the problem leads the observer to believe that the attitude of one Wisconsin farmer who was asked what he would take for the service is indicative of what the service means. That farmer who had paid several hundreds of dollars for his connection and then deeded it to the central station without any return for his investment, other than service received, pointed to the lessened fire hazard and more comfortable and efficient working conditions in the barn and haymow, the greater home comfort and the equipment repair work during the busy season that he had been able to do, without taking time from the daylight hours so badly needed in the field, and then remarked, "That is money I never want to see again." The investigator is constantly confronted with proof that such service represents a distinct economic advance for the farmer in the improvement of his working conditions and conservation of high-priced labor. Central stations must face the problem of providing it. Another significant fact is the careful investigation being conducted by various commercial agencies to whom the development would mean a large volume of business. The plan must not be a temporary one, with no thought of the future, but one that, while it may include temporary measures, looks toward the service as a permanent part of the company business.

Financing Plans

The present situation makes financing in the ordinary way impossible and companies have devised various ways of meeting the situation. The principal methods met with are:

(a) The farmers provide the money for the construction of the lines (except metering equipment), which are built by the central station, then becoming central-station property. Maintenance is a central-station responsibility.

(b) The farmers are asked to buy sufficient company securities (preferred stock or bonds) to finance the lines. Ownership and maintenance rests with the central station.

(c) The farmers are asked to advance the money on

notes payable at some future time. The ownership and maintenance is a company responsibility.

(d) The farmers are allowed to form their own companies, build, operate and maintain their own lines, energy being sold at some definite point on a wholesale basis. This leaves the farmers to handle the cost of service as they choose.

Schemes (a), (b) and (c) take from the farmer the responsibility of building and maintaining the lines. This is extremely desirable, as farmers are no more capable of handling central-station work than the central-station man is of handling that of the farmer. The net result of the adoption of any of these schemes of financing will be the elimination of future maintenance difficulties that can prove decidedly embarrassing, even though the central station might not be legally responsible.

The scheme in (d) means the building up of rural utilities that legally are competent to carry on all classes of utility work, though they can possess neither the knowledge nor afford to employ competent staffs to accomplish the necessary results. Because of low prices offered, the most frequent happening is the falling of such companies into the hands of the curbstone contractor, whose immediate concern is the profit he secures from each job and who is not troubled by any evil effects of poor construction or improper consideration of the rights of other utilities. Such companies may also fall into the hands of the curbstone contractor on maintenance work, because the supply business which the farmer has to place presents an attractive profit, that may be secured if the contractor will take the line maintenance at a low figure. Since the farmer is not competent to pass judgment on such matters, slighting of the maintenance work for a considerable period is an easy matter. When the crash comes the contractor is usually in position calmly to step out from under and the central station and the farm utility must face the music. Some central-station companies endeavor to take over the maintenance work under a contract with the rural utility, but such a contract is for a period of years, at the end of which the work can pass out of the control of the central station. While it may not so result in all cases, scheme (d) does provide the groundwork for endless future controversies and trouble between the central station and the farmers. Because it may solve a serious financial and a puzzling maintenance problem temporarily is no reason why the industry should ignore its ultimate possible results.

Form of Rates

There should be no blinking at two facts, the first being that the rates applying to the same character of service in urban territory do not provide for a proper return on rural business, because of the scattered condition of the load and the relatively greater investment and operating expense per customer. The second is that the business must pay its own way, not only as to cost of distribution lines and customers' equipment but also as to power plant and transmission-line investment. This latter item is one that has not yet received proper consideration. Because of the relatively small demand so far, on generating and transmission facilities, central-station men have largely ignored this factor. If farm loads are to become a permanent factor in central-station business this item must receive full consideration, otherwise the future must bring troubles, embarrassing, if not serious. Two general forms of rate schedules, either one of which can be made to obtain the desired results, have been made use of. They are:

1. A rate consisting of a fixed charge, for which no energy is received, plus the rate regularly charged for the same service in the nearest city or town territory. The assumption is made that the regular rate already in use provides for the return, depreciation and other fixed charges on the power plant and transmission-line investment as well as the cost of operation and profit on the business to which it applies. It does not provide for fixed charges for line and transformer losses, cost of maintenance of the scattered rural lines, cost of meter reading or any of the other costs that for rural service are in excess of the cost of giving the same service in city or town territory. The fixed, or, as it is called in some cases, the "rural," charge is designed to cover all these items. Where the farmer has borne the cost of construction no interest has been allowed, though to cover the hazard of developing and carrying on the business a small percentage has been allowed on the investment. In the form of rate recommended by the committee of the Wisconsin Electrical Association an item of 2 per cent was allowed to cover this factor. The fixed charge form of rate has the advantage of encouraging the use of current, because the customer is brought to realize that he is paying a fixed amount for service. His kilowatt-hour rate is relatively low and there is no tendency to hold the bill down as in the minimum charge form of rate.

2. A minimum charge form in which three rate steps are provided, *viz*: A primary rate, a secondary rate and an excess rate. To this rate is added a minimum charge of a certain number of kilowatt-hours at the primary rate. The minimum kilowatt-hour requirement and the units given on each step of the rate depend on the customer's load. The disadvantage of such a rate is that the consumer ordinarily uses every effort to avoid going over the minimum bill each month. The state of mind which induces this attitude is a difficult one to combat and is the principal argument against the rate.

What central-station men must realize in this problem is that service rather than kilowatt-hours is being sold. This cannot be stressed too strongly. The argument that adjoining city or town rates are lower than those quoted to farm consumers must be met by a demonstration of the difference in conditions. This can be done on a man-to-man basis and if carefully and tactfully handled little difficulty has been encountered. Experience has so far demonstrated that the majority of farmers quickly grasp and concede the point. The idea, like all other ideas, must be sold, and failure, as in other things, more often lies in the salesman than in the idea.

Forms of Construction

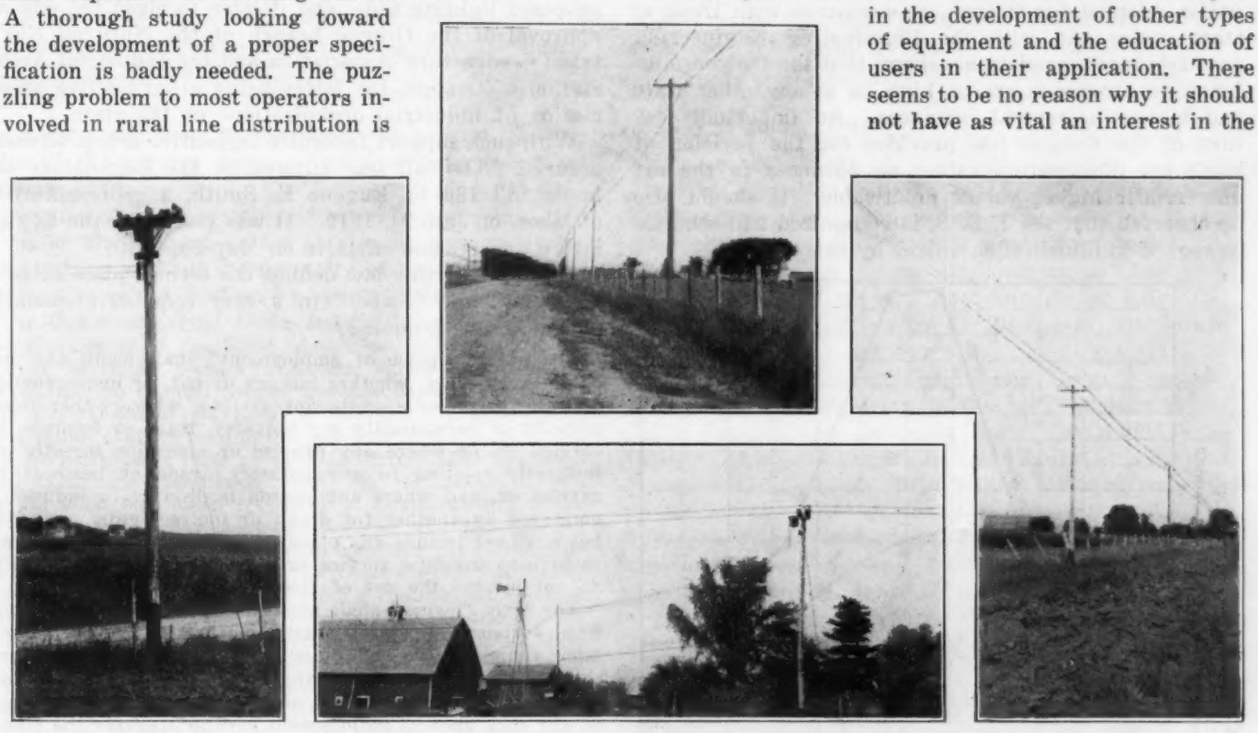
Types of construction for rural service lines are not well developed; in fact, except for a few individual cases, no efforts have been made to develop specifications for such lines. Several things must be kept in mind: Low first cost is essential, but it must not be obtained at the cost of substantial construction. The lines are light and strength is easily secured by the selection of sturdy poles of possibly 30 ft. (9 m.) length, setting poles well into the ground and reasonable storm and corner guying, at little more cost than that of a line of light poles, inadequately guyed and

looking cheap. The illustrations show lines of 30 ft. (9 m.) poles set 5 ft. (1.52 m.) in the ground on straight lines and 6 ft. (1.82 m.) at strain points. Either patent anchors or 5 ft. (1.52 m.) creosoted dead men attached to ⅝-in. x 6-ft. (16-mm. x 1.82 m.) anchor rods are used, while steel guy strand of not less than ⅛ in. (8 mm.) double galvanized and pole shims and hooks are used. The lines and guying are light, but in proportion to the loads carried they are as well built and will last as long as any city lines carrying heavy loads. The result is not accomplished by skimping material, but by fitting material to the demands made upon it. Cheap lines secured by skimping can be the most expensive in the long run and must be avoided.

A thorough study looking toward the development of a proper specification is badly needed. The puzzling problem to most operators involved in rural line distribution is the cost of operation. City figures do not apply because of the distance that must be covered. Whether meters should be read monthly or at longer intervals is a much-debated question. Various schemes enabling the farmers to read meters monthly, with a check reading every few months by a competent meter reader, have been suggested. How fuses shall be replaced is debated, though for the service fuses on low voltages the farmer can be quickly instructed how to do it himself. Primary fuses undoubtedly must be replaced by central-station employees and cost of such service included in the fixed charge.

The difficulty at the present moment, however, is lack of sufficient records on specific installations that tell what the actual costs are. Experience will probably demonstrate that the costs are not as serious as they now appear in the absence of definite information. Intelligent study through adequate records will furnish the information eventually. The solution of the problem is up to the central station.

If the demand for service is founded on an economic reason, the central stations are facing the same problem that has pressed for solution in all other phases of the industry, *viz.:* the education of the customer in the proper use of his service. The household appliances of the city home fit the farm home as well, and the educational work necessary can be confidently outlined. Some progress has been made in the development of equipment for exclusive farm use. The milking machine, the cream separator, the churn, hay-hoisting equipment, all electrically driven, are examples, but the subject has as yet only been touched. As the demand increases more special farm equipment must be developed. The central station has had a vital part in the development of other types of equipment and the education of users in their application. There seems to be no reason why it should not have as vital an interest in the development of farm-like equipment and the education of the farmer in its use. This means careful study of the problem by central-station men.



CHEAPNESS DOES NOT MEAN POOR WORK AND FLIMSY LOOKING RURAL LINES

These views, taken on the Wisconsin-Minnesota Light & Power Company system near Eau Claire, Wis., illustrate what can be done in putting up substantial rural lines. Poles are sturdy 30 ft. (9 m.) cedars, well guyed, set 5 ft. (1.52 m.) in the ground, and everything put up in a neat, workmanlike style. At left—Transformer mounting (2,300-volt) and service takeoff. Compression type arresters are used. At top, center—Straight-away line. Telephone lines are kept on opposite side of road. Arrangements to move them are made if it is considered necessary. At right—Transposition schemes are worked out. This shows the method of making transpositions. At bottom, center—Side view of transformer mounting.

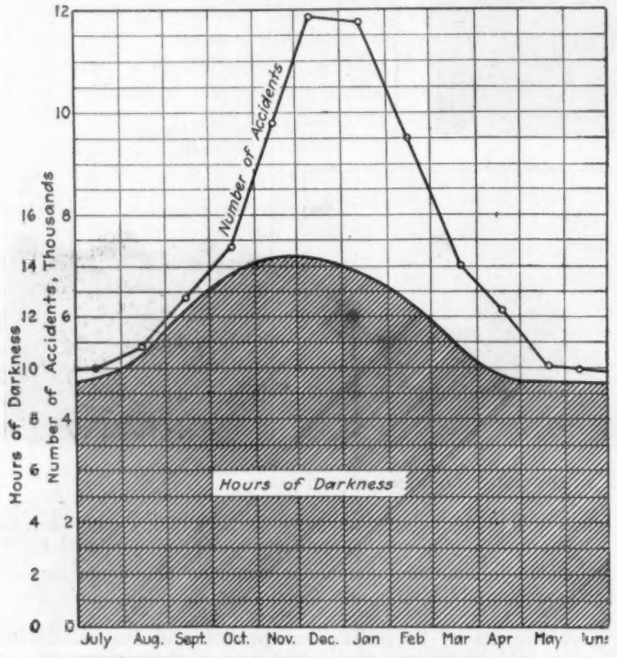
AS THE *maxim for the teacher is, "Always know more than you are required to teach," so research stands for the challenge of the open door. Teaching is not an adequate instrument of scholarship. The professor in any science in any college stands today on the shore of the great ocean of knowledge as truly as Sir Isaac Newton did, and must take cognizance of the Beyond. Lincoln said the problem of democracy is to create a Government strong enough to protect the state, but not so strong as to take away the liberties of the citizens. So the duty of the college is to get all the teaching possible out of its faculty without quenching their enthusiasm or preventing their search for new knowledge. This surely is not to be done by closing the door to research or by parsimonious equipment of the laboratories.*—HENRY A. STIMSON.

Modern Industrial Lighting for Oregon

Based Upon Experience in Other States and the Recommendations of the Illuminating Engineering Society, an Exemplary Code Was Adopted—Provision for Raising Standards as Better Lighting Practice Develops

By F. H. MURPHY
Illuminating Engineer Portland Railway, Light & Power Company

OREGON is one of the most recent recruits to the group of states having industrial lighting codes and has thus been able to benefit by experience with lighting codes in other states. An examination of the table of typical values of illumination adopted for Oregon, as compared with those of other states and with the Illuminating Engineering Society's recommendations, shows that the Oregon minimum requirements are as high as in any other state and higher in several instances. An important feature of the Oregon law provides for the revision of minimum illumination values as advances in the art may render higher values practicable. It should also be observed that the I. E. S. is recognized as authority in regard to illumination values by this state.



INDUSTRIAL ACCIDENTS DEPEND UPON LIGHTING
Monthly distribution of accidents show how they increase during darker period of year.

During the late war L. B. Marks, chairman of the divisional lighting committee, a subdivision of the Advisory Council of National Defence, urged the Oregon representative of that committee to take steps toward securing the adoption of an industrial lighting code for the state.

How Legislative Action Was Secured

At that time neither the State Bureau of Labor nor the State Industrial Accident Commission had the authority to promulgate any new safety rules. It was necessary, therefore, to secure legislative action if such a code was to be adopted. Charles H. Gram, the incoming State Commissioner of Labor, was very much in favor of a lighting code similar to that proposed by the Illuminating Engineering Society and the divisional lighting committee, as also was William A. Marshall, chairman of the State Industrial Accident Commission. At its annual convention the Oregon State Federation of Labor went on record as indorsing the proposed lighting code, and it later received the official approval of the Oregon branch of the National Electrical Contractors' Association and the Industrial Association of Oregon, the latter being a very active association of industrial organizations of the state.

With such support favorable legislative action seemed assured. The bill was entered in the Legislature as house bill 186 by Eugene E. Smith, a representative of labor, on Jan. 24, 1919. It was passed by the Legislature and became effective on May 29, 1919.

Section 1 of this law defines the terms "place of employment" and "owner" in a very conclusive manner and is herewith quoted:

> The phrase "place of employment" shall mean and include every place, whether indoors or out, or underground, and the premises appurtenant thereto, where either temporarily or permanently any industry, trade or business is carried on, or where any process or operation directly or indirectly relating to any industry, trade or business is carried on, and where any person is directly or indirectly employed by another for direct or indirect gain or profit, but shall not include any place where persons are employed in private domestic service or agricultural pursuits which do not involve the use of mechanical power.
>
> The term "owner" shall mean and include every person, firm, corporation, state, county, town, city, village, manager, representative, officer or other person having ownership, control or custody of any place of employment or of the construction, repair or maintenance of the buildings of any such place of employment or who prepares the plans for the construction of any place of employment.

These two definitions were taken verbatim from the Industrial Commission Laws of the State of Wisconsin, as it was felt that the field of action to be covered and the persons to be reached were most effectively included within this wording. At the time it was felt that the Commissioner of Labor had the authority to compel the removal of glaring lights wherever they might be a real menace to any considerable number of people as well as to require sufficient illumination to reduce materially accidents in all poorly lighted places where persons must of necessity work.

Sections 2 and 3 require that in all passageways, halls, stairs, workrooms, etc., where people are employed there must be proper and sufficient lighting.

Section 4 requires that this lighting shall be in accordance with a schedule of minimum values to be determined as set forth in section 8.

Sections 5, 6 and 7 demand the elimination of glare, the proper equipment and installation of the lights to secure reasonably uniform illumination, and installation and control of pilot and emergency lights.

There is nothing new in the above sections, as their requirements are based upon the suggestions of the Industrial Lighting Code of the Illuminating Engineer-

MINIMUM LIGHTING REQUIREMENTS IN OREGON SHOULD PROMOTE SAFETY AND HEALTH IN INDUSTRIAL ESTABLISHMENTS

At left—Lighting of a large sawmill showing one of the trimmer sections in the foreground lighted by means of deep-bowl porcelain-enameled steel reflectors hung as high as the framing will permit. The illumination immediately in front of the saws is approximately 7 foot-candles. At right—A combination of local lighting with porcelain-enameled steel reflectors and general illumination with mirrored glass reflectors in the loom room of a woolen mill. General illumination is about 1 foot-candle.

ing Society and form the basis for the general lighting rules of the various states which now have industrial lighting codes.

Because of the necessity of providing a means for changing the limiting values as may be desirable from time to time without the necessity of repeatedly invoking legislative aid, Section 8 was introduced, as follows:

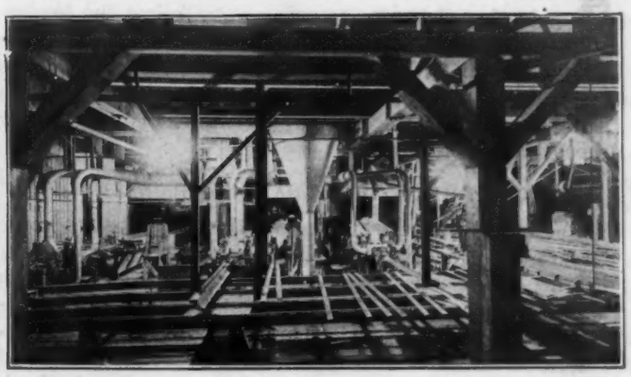
The Commissioner of Labor and Inspector of Factories and Workshops of the State of Oregon is hereby authorized to establish certain minimum values for lighting, which shall be deemed proper and adequate in accordance with the conditions set forth in this act. In arriving at what values shall be used in this schedule of minimum lighting, and such other rules as shall determine definitely what shall constitute compliance with the provisions of this act, he shall be guided by the best engineering practice as set forth in the recommendations of the Illuminating Engineering Society. Before such schedule and rules, however, shall become effective, the Commissioner of Labor must, upon his own motion, appoint a commission of three persons, one to represent the manufacturing interests, one to represent the operating electrical workers, and one must be an electrical engineer. Notice of the public meetings of such commission shall be published in the leading newspapers of each county in the state, giving the time, place and purpose of such meetings. The commission shall have power, after holding these public meetings, to establish, to rearrange or to readjust the schedule or lighting values and rules as above set forth. These rulings or readjustments shall then become effective thirty days after they have been made, and the Commissioner of Labor shall serve notice, in writing or by publication in the leading newspapers of each county in the state, of the rulings thus made and of the date upon which they become effective.

In this section it will be seen that the Illuminating Engineering Society is recognized as the standard authority on the matter of illumination values.

It was intended that the provisions of Section 8 should enable the Commissioner of Labor virtually to have the same power relative to establishing and revising safety rules for proper illumination as that with which progressive thought has empowered industrial commissions in such states as Wisconsin, California and others.

Since that time public opinion in Oregon has advanced rapidly, and owing to the very efficient action of the Oregon and Columbia Basin Division of the National Safety Council, the Legislature at a special session held in January, 1920, passed a bill authorizing the State Industrial Accident Commission to establish all necessary and reasonable safety rules, proper regulations and provisions, and providing for the enforcement of such orders and decisions by the Commissioner of Labor. This now places Oregon on the level of other states where industrial commissions have the power to initiate any necessary safety regulations.

Commissioner Gram later appointed a Lighting Commission of three persons—F. C. Knapp to represent the manufacturing interests, V. H. Haybarker to represent the operating electrical workers, and F. H. Murphy as electrical engineer. This commission prepared a set of eleven "General Lighting Rules" and held a public meeting in Portland on June 28, 1919. The Labor Commissioner, following the recommendation of the Lighting Commission, published the rules, and they then became effective on July 28, 1919.



RAISING ILLUMINATION STANDARDS, AT THE SAME TIME AVOIDING GLARE

At left—Lighting of a section of one of the public docks by means of porcelain-enameled steel reflectors. The average illumination is very uniform and without glare. At right—Lighting of the planer section of a large sawmill by means of inclosing globe units equipped with reflectors. The average illumination is approximately 3.5 foot-candles.

These rules are very similar in most respects to those adopted by other states. The first rule is devoted to the definition of terms which are used in the rules. The various terms are arranged in alphabetical order for convenient reference.

Rule 2 is general and Rule 3 provides for adequate natural light, the minimum requirements of which are twice those for artificial light. Rule 4 gives the table of minimum illumination requirements for various working conditions. These correspond very closely with the recommendations of the Illuminating Engineering Society.

In order to make a comparison of the requirements of the various states now having industrial lighting codes, the accompanying table is submitted. These data have been taken from the lighting code bulletins of the states given and are presumably correct to date. In some cases where states did not have classifications corresponding in every respect to those in the first column, but did show somewhere in their codes requirements for similar locations, these have been included in the tabulation in order to make it more complete.

The classifications (a) to (i), inclusive, are those of the Oregon code, (j) being added to care for a special division used in a number of states.

COMPARISON OF LIGHTING CODE REQUIREMENTS IN VARIOUS STATES

Classification	1917 I.E.S.	1919 Ore.	1919 Cal.	1918 Wis.	1919 Ohio.	1918 Penn.	1918 N.J.	1919 N.Y.
(a) Roadways and yard, thoroughfares	0.02	0.02	0.02	0.25	0.02	0.02	0.02	0.02
(b) Storage spaces	0.25	0.25	0.25	0.25	....	0.25	0.25	0.25
(c) Stairways, passageways and aisles	0.25	0.25	0.25 0.50	0.25	0.25	0.25	0.25	0.25
(d) General lighting for workrooms	....	0.50	0.25	....	....	....	....	....
(e) Toilets, washrooms, water closets, dressing rooms and elevator cars	....	1	0.25 0.50	0.50	0.50	....	....	....
(f) Rough manufacturing such as rough machinery assembling, bench work or foundry floor work	1.25	2	1	1.25	1	1.25	1.25	1
( ) Fine manufacturing such as fine lathe work, pattern and tool making and light colored textiles	3	3	3	3	3	3	3	3
(h) Office work, such as accounting, typewriting, etc	3	3	3	3	3	3	3	3
(i) Special cases of fine manufacturing, such as watchmaking, engraving, drafting and dark colored textiles	5	5	5	5	5	5	5	5
(j) Rough manufacturing, involving closer discrimination of detail than (f)	2	2	2	2	2	2	2	2

There is a striking conformity to the Illuminating Engineering Society's recommendations in most of the classifications by all the states. This is very encouraging in that it shows a tendency to follow the leadership of a recognized authority in most essentials. This tendency, if followed to the same extent by other states as they adopt lighting codes, will overcome some of the disadvantages of the lack of national legislation along these lines.

MAKING MINIMUM ILLUMINATION VALUES ADEQUATE

The only case where discrepancies occur between the Oregon classification and that which the Illuminating Engineering Society has recommended is in (f), "rough manufacturing, etc." In the case of Oregon the Lighting Commission felt that there probably would be considerable difficulty in discriminating between (f) and (j) and that the requirement of 2 foot-candles for both classifications would not work a serious hardship on any industry. For that reason the two were combined and the minimum placed as 2 foot-candles.

Under (e), "Toilets, etc.," Oregon requires 1 foot-candle, while in other states where requirements are made the range is from 0.25 to 0.5 foot-candle. It was felt that better illumination in such places would encourage greater cleanliness and consequently better sanitation, which is only another method of reducing health accidents. It did not seem that such a condition could be effectively brought about with less than 1 foot-candle, neither did it seem to the Lighting Commission that the requirement of such a lighting intensity would work a hardship in any case.

Oregon requires a minimum of 0.5 foot-candle for (d), "General lighting for workrooms." This is for the purpose of avoiding the extreme contrast condition usually accompanying an installation of local lighting, which is not only an accident hazard but also the cause of severe eyestrain. Under the distribution of light ruling, California requires for the same conditions a minimum of 0.25 foot-candle, and one or two other states require that "there shall be employed in addition a modern intensity of overhead lighting."

Rule 5 requires light measurements by means of a standard photometer, while Rule 6 provides for the shading of lamps and the elimination of glare in overhead-lighting systems and Rule 7 provides for similar protection for lamps used in local lighting systems. Rule 8 requires the installation to be made so as to "secure a reasonably uniform distribution of the illumination, avoiding objectionable shadows and sharp contrasts of brightness." Rule 9 provides for emergency lighting and Rule 10 for location of switches and controlling apparatus for emergency and pilot lights.

The above rules are almost identical with those of California and Wisconsin and very similar to those of other states with the exception that they are more explicit.

Rule 11 requires that "All lighting equipment and windows shall be periodically cleaned, inspected, kept in order, and when defective replaced, so that the intensities of illumination will never fall below those specified in Rule 4."

While Rule 4, which requires certain minimum lighting intensities, might be sufficient to compel proper maintenance, yet the Lighting Commission felt that the impression upon the public would be greater by calling attention to the great need for proper maintenance and by making it compulsory. So far as the author is aware, Wisconsin is the only other state having such a rule at the present time.

The "Industrial Lighting Code Bulletin" issued by the Bureau of Labor of the State of Oregon contains in the first part the legislative acts and the general lighting rules. The second part is devoted to a detailed discussion of each rule, with the idea of making the meaning of the rule clear enough so that the average electrician will have no difficulty in either understanding or applying it. This section in addition includes a general discussion of glare, with the idea of emphasizing its importance and danger, a treatment of proper lighting equipment and also methods of using natural light to best advantage. A discussion is given on the method of determining the proper spacing and hanging heights, as well as the wattage of the units for a given installation. Believing that the easiest way for the average layman to determine the proper size of lamps to use is to reduce the data to watts per square foot, such a table was prepared, showing the wattage per

square foot for three standard types of lighting equipment and for various lighting intensities ranging from 0.02 foot-candle to 25 foot-candles.

The third part of the bulletin presents a number of illustrations showing principally good lighting installations obtained by means of various kinds of lighting equipment, while the fourth part contains a table of lighting intensities for a varied line of industrial plants. Two columns of intensities are given. The first column gives the minimum required by the general lighting rule and the second column gives the recommended value. The lower limit in each case under the recommended values represents the lowest value which will give practical results. The upper limit represents what is commonly referred to as "productive intensities."

Criticism has been made in some cases regarding the inclusion of a large table of lighting intensities with the rules, the feeling being that this tended to overemphasize the importance of illumination values as compared with certain other rules, such, for example, as the elimination of glare. In the Oregon bulletin the Lighting Commission has endeavored to overcome this objection by emphasizing the special features of the rules, such as the elimination of glare and the selection of proper lighting equipment, and, further, by placing the table of lighting intensities at the back of the bulletin, where it does not tend to overshadow the other features of the code.

The Bureau of Labor expects soon to make a survey of the lighting conditions in industrial plants of the state, and an educational campaign will be carried on as the best means of securing compliance with the law.

Remodeling Ignition Arches

Importance of Properly Proportioning Ignition Arches to Combustion Rates—Desired Stoker Dimensions Materially Influence Ignition Arch Design, on Which Capacity, Efficiency, Responsiveness and Fuel Range Depend

By T. A. MARSH
Chief Engineer Green Engineering Company

THERE are two possible capacity limitations in furnace operation—first, the ability to ignite fuel; second, the ability to burn it when once ignited. The first is dependent very largely on design of the furnace and the stoker arch; the second is dependent on the draft in the furnace.

With the present-day knowledge of fuels, their ignition temperatures and characteristics, there is no reason for furnaces designed with insufficient arch to ignite all the coal that the draft will burn, and it should therefore never be necessary to slow down or stop the stoker in order to permit the coal to ignite at the front.

The height, slope and length of ignition arches have been discussed, but have unfortunately been very loosely treated in the design of furnaces. For example, some combustion engineers may recommend arches 6 ft. (1.8 m.) long, regardless of the combustion rate desired and the length of stoker or igniting characteristic of the fuel. There are, however, certain known performances of ignition arches with certain coals which serve as a basis of design of furnaces in so far as arch height, slope and length are concerned. It is therefore the purpose of this paper to set forth the principles involved and to establish a basis of standardization of arch designs for various grades of coal.

Before an analytical discussion of arch design can be made it is necessary to consider the principles involved and the variables affecting the problem. First of all, arches or furnace roofs serve the double purpose of igniting the incoming fuel and of directing the products of combustion into the lower portion of the heating surface of the boiler. Variables affecting arch length:

(a) Ignition rate.
(b) Percentage of volatile combustible in the fuel.
(c) Calorific value of the fuel.

"Ignition rate" as used in this article is the product of the combustion rate in pounds of coal as fired per square foot of grate surface per hour and the stoker length; in other words, it is the amount of coal which must be ignited per foot of stoker width per hour.

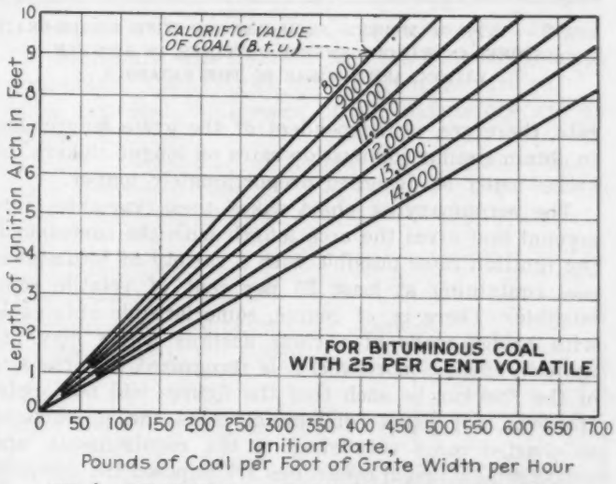

CALORIFIC VALUE OF COAL (B.t.u.)
8000
9000
10000
11,000
12,000
13,000
14,000
FOR BITUMINOUS COAL WITH 25 PER CENT VOLATILE
Length of Ignition Arch in Feet
0 1 2 3 4 5 6 7 8 9 10
0 50 100 150 200 250 300 350 400 450 500 550 600 650 700
Ignition Rate,
Pounds of Coal per Foot of Grate Width per Hour

FIG. 1—RELATION OF ARCH LENGTH TO IGNITION RATE

Obviously, the higher the combustion rate desired, the greater must be the provision for igniting the fuel; also the longer the stoker with a given combustion rate, the greater must be the provision for igniting the fuel. Therefore, all other items remaining constant, longer arches must be provided for higher combustion rates and for longer stokers.

As the percentage of volatile combustible decreases extra provision must be made to ignite the fuel. Fuels containing as low as 12 per cent of volatile have been successfully handled on chain grates, but the problem of furnace design becomes highly special in this region.

The higher the calorific value of the fuel the higher the furnace temperature and the more intense the ignition become. In regard to stoker length, for many years arches were rather promiscuously applied in furnace.

and frequently stokers 11 ft. (3.4 m.) and 12 ft. (3.7 m.) long were equipped with arches no longer than those provided for stokers 9 ft. or 10 ft. (2.7 m. or 3 m.) long. The result was that there was insufficient ignition effect to keep the grates properly covered, and in consequence long stokers fell into disrepute, many engineers contending that a length of 10 ft. (3 m.) was close to the limit and that additional grate length was ineffective. Recent practice, however, of making arches proportionately longer with increase in the stoker length has rendered the grate area of stokers 15 ft. to 18 ft. (4.6 m. to 5.5 m.) long just as effective as that of shorter stokers and has resulted in very much improved capacity on larger units.

Ignition arches should be designed for their ability to ignite coal at certain rates per hour. The ignition

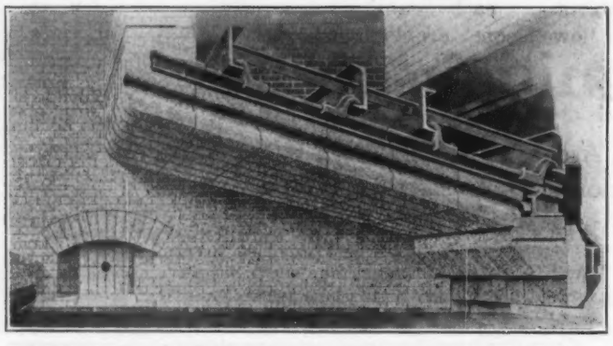


FIG. 2 — TYPE OF MODERN ARCH FOR USE WITH CHAIN-GRATE STOKER IN WHICH GENERAL OUTLINES, IN SIDE ELEVATION, ARE SIMILAR TO THE PARABOLA

rate, therefore, is independent of the grate length, but to obtain similar combustion rates on longer stokers the arches must be designed proportionately longer.

The accompanying chart takes these variables into account and gives the arch length with the corresponding ignition rates possible with a variety of bituminous coal containing at least 25 per cent of volatile combustible. There is, of course, some latitude obtainable with bridge walls of various designs which may aid ignition effects; moreover, it is recognized that the size of the fuel can be such that the figures will not apply. However, for usual commercial cases the proportions as charted come very close to the requirements, and unless some unusual conditions are imposed the designer is safe to follow the chart.

The method of use of this chart is as follows: Suppose it is desired to obtain a combustion rate of 35 lb. (15.9 kg.) of 10,000 B.t.u. (5,520 cal.) coal per square foot of grate surface per hour (as fired basis), on a chain grate having an active grate length of 10 ft. (3 m.). The ignition rate in this case is 35 lb. × 10 or 350 lb. (159 kg.) per hour. In order to determine the length of arch required for this ignition rate it is necessary only to read upward on the chart to the point where the ordinate 350 intersects the 10,000 B.t.u. coal line, and then read on the corresponding point on the left-hand margin the length of arch required. In this case it is 6.3 ft. (1.9 m.); in other words, an arch 6.3 ft. long will ignite 35 lb. (15.9 kg.) of 10,000 B.t.u. coal per square foot of grate surface on a stoker 10 ft. long.

The curves shown are based on actual performance with fuel of high volatility. There is a margin of safety due to the fact that some of the combustion rates on which this chart is based were obtained with low-set arches and designs which have been materially improved since the data were obtained. From this it is evident that furnaces designed in accordance with the accompanying chart will have a comfortable margin which will take care of irregularities of fuel and of operating conditions.

The height and slope of ignition arches has also been much discussed. In early practice arches were set close to the fuel bed, many being only 9 in. (22.9 cm.) above the grate, which would leave only 3 in. or 4 in. (7.6 cm. or 10.2 cm.) between the top of the fuel bed and the bottom of the arch. Nearly all arches were set parallel to the grate or nearly so. Recent practice has shown that the effectiveness of the front portion of the fuel bed can be increased by setting arches higher and pitching them up steeply toward the rear. Experiments have been made at all heights from the top of the fuel bed up to 24 in. (60.8 cm.) above the grate, and for the average condition a height of 15 in. (37.7 cm.) above the grate produces best general results.

SLOPE OF ARCH NOT DEFINITE

As to slope, experiments do not seem to have determined the limit. This much is determined, that 2 in. per foot (16.4 cm. per m.) is better than 1 in. (8.3 cm.), and 3 in. (25 cm.) is better than 2 in. Arches pitched 4 in. to the foot (33.4 cm.) give results apparently the same as those pitched 3 in. except perhaps a slightly greater tendency to permit smoke to be made. Average conditions therefore call for ignition arches set 15 in. (37.7 cm.) high in front, pitched 3 in. per foot and of length to be determined as outlined from the chart.

There is a theory among combustion engineers that the ideal form of furnace would have the outline of a parabola with the focus at the point of the entering fuel. The theory is based on the fact that the parabolic outline gathers all rays from side walls, bridge wall and fuel bed and concentrates these rays at the focus or point of entering fuel. This theory has not been disproved in practice, but it should be stated that it was developed by the use of a trowel rather than by the use of analytical geometry. Certain furnaces were found to give better results than others, and, the facts tabulated, the theory of design was formulated.

Some arches, such as the one shown, have outlines very similar to the parabola, and by properly proportioning the height, length and pitch of these arches very intense ignition results. No modern chain-grate installation should be limited in capacity by the ability to ignite coal. Prompt, strong, deep ignition is the secret of furnace and stoker success. The more intense the ignition, the quicker will be the distillation of the volatiles and the earlier will the combustion of fixed carbon start.

Strong ignition therefore means high capacity (provided ample draft is provided), high efficiency due to high furnace temperature and ash low in carbon. Strong ignition also gives responsiveness to the furnace and widens the range of fuels which can be burned.

The arch therefore is the pivot on which capacity, efficiency, responsiveness and fuel range depend. Practically all furnaces installed prior to five years ago can be redesigned with remarkable improvement. Many more recent designs permit much improvement. Coal from year to year gets no better in quality, while demands for steam and higher ratings increase daily.

Unit Idea in 100,000-Hp. Electrical Layout*

To Assure Reliability of Service and Simplicity of Operation Each 32,500-Kva. Generator in Niagara Falls Extension Has Been Dealt with as a Separate Plant—Logical and Orderly Grouping Given Careful Attention

By J. ALLEN JOHNSON
Electrical Engineer Niagara Falls Power Company

IN THE design of the Niagara Falls extension careful attention was given to the logical and orderly placing and grouping of apparatus. On account of their large size each unit was, to a great extent, considered as a complete plant in itself, being provided with its own individual auxiliaries conveniently grouped about it. Thus, if one stands upon the operating gallery on the center line of a unit, in front is the passage to the thrust-bearing deck of the generator, with bearing thermometers and oil flow indicators in plain view. At the right hand, near the front of the gallery, is the turbine governor, with tachometer and pressure gages, and to the right of that a pedestal for the control of the penstock valve, which pedestal also carries an illuminated turbine gate-opening indicator. At the left hand is the exciter switchboard, containing exciter and fan-motor starting equipment, generator protective relays and generator field-circuit breakers. To the left of this switchboard stands the motor-generator exciter. Thus practically all devices requiring constant oversight or frequent manipulation are concentrated at one level where a minimum number of operators can attend them with a minimum of labor.

On the main floor under the gallery, directly beneath the governor, are the governor accessories, comprising tanks, valves, piping, etc., and beneath the switchboard are the electrical switches for exciter and fan control, and beneath the exciter the ventilating fan. Below the main floor the hydraulic passages, valve, penstock, etc., occupy one side and the passages for electric wiring and ventilation the other. Piping connections for oil, water and compressed air are on the right, all electrical connections on the left.

The first of the three generators, known as No. 16, was supplied by the Allis-Chalmers Manufacturing Company, the second, No. 17, by the General Electric Company, and the third, No. 18, by the Westinghouse Electric & Manufacturing Company. The three generators are similar in design, dimensions and characteristics, each manufacturer, however, having been allowed considerable liberty in mechanical design and in the treatment of details. (These will be discussed in separate contributions by F. D. Newbury, W. G. Foster and R. B. Williamson.) The units are of the vertical-shaft type, three-phase, 25 cycles, 12,000 volts, 150 r.p.m., Y connected. They are given two ratings, one corresponding to the point of maximum efficiency of the hydraulic turbines, called the "normal" rating, and in addition a "maximum" rating. The ratings follow:

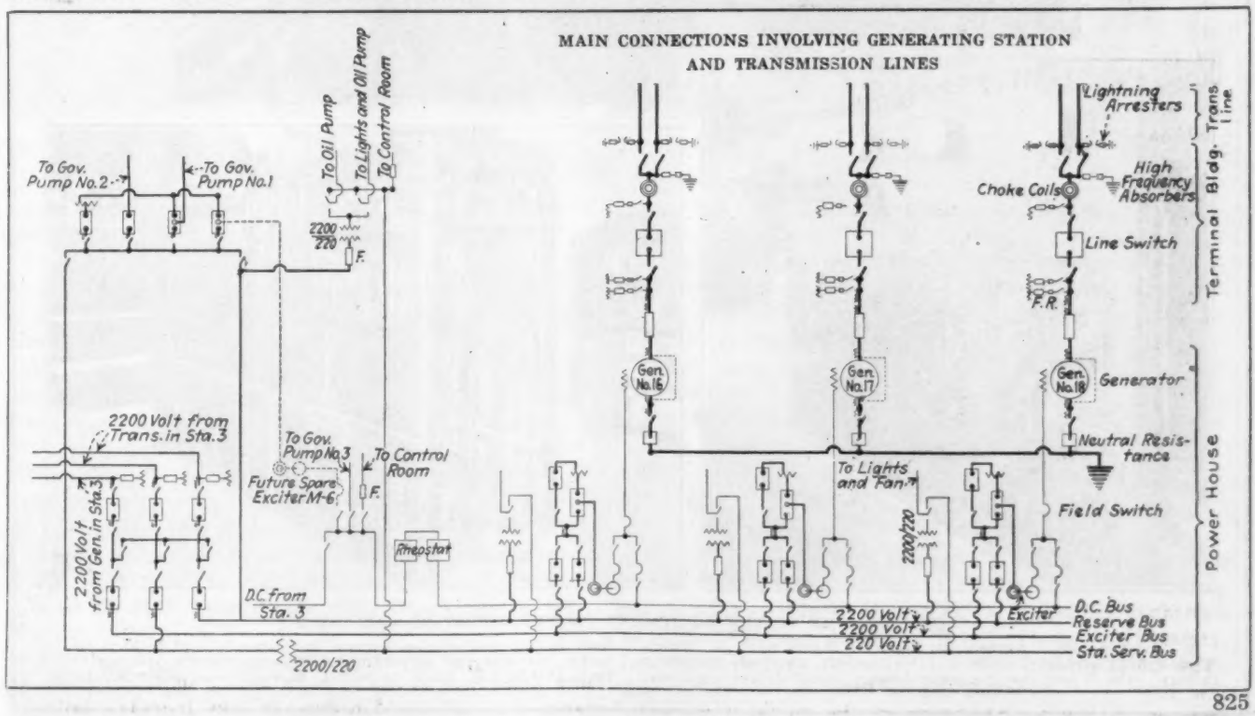
Rating	Kw.	Pf.	Kva.	Amperes
Normal	24,000	.9	26,700	1,285
Maximum	26,000	.8	32,500	1,564

In addition it was specified that the generator should be capable of absorbing 36,000 hp. from the turbine.

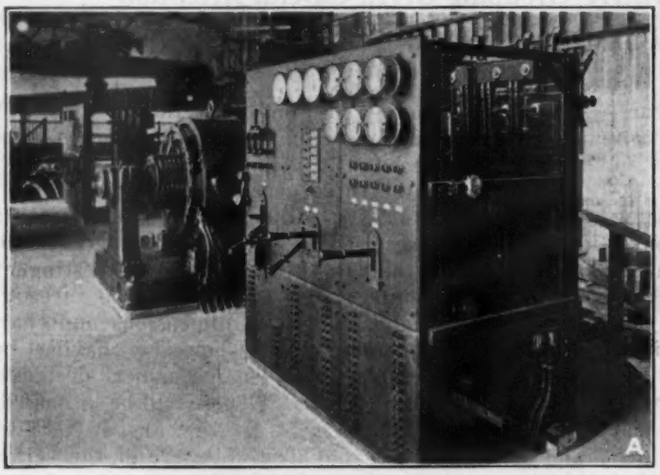
The principal dimensions of the generators are as follows:

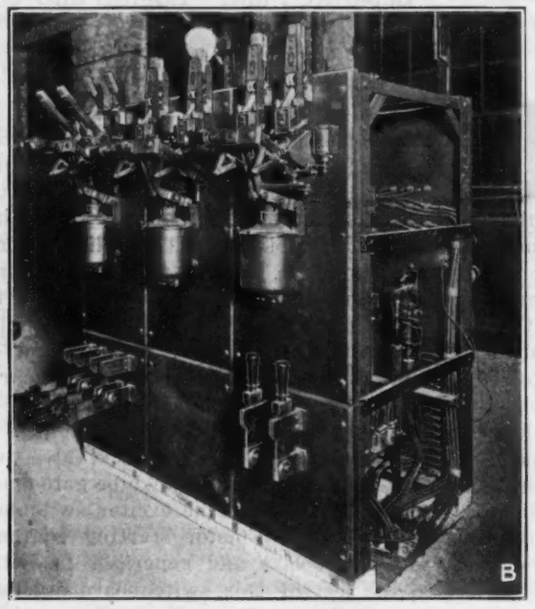
Outside diameter of frame	21 ft. 6 in. to 21 ft. 9 in.
Height to top of frame	9 ft. 5 in.
Height to thrust-bearing deck	13 ft. 2⅜ in.
Height over all	20 ft. 2⅛ in.
Rotor diameter	16 ft. 2⅞ in. to 16 ft. 5½ in.

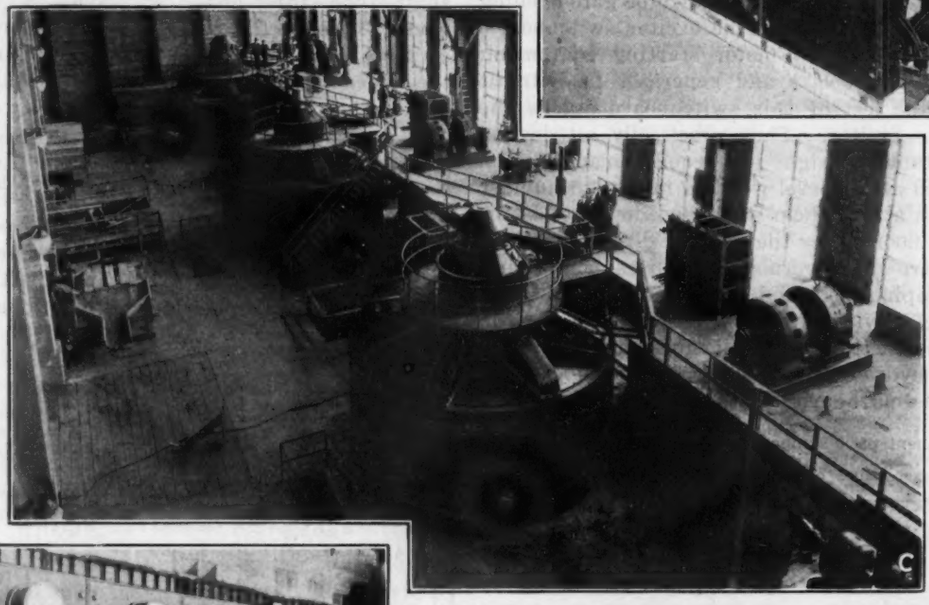
*Fourth installment of a symposium on the 100,000-hp. extension to Station No. 3 of the Niagara Falls Power Company; see Sept. 18, Oct. 2, etc., issues of ELECTRICAL WORLD.

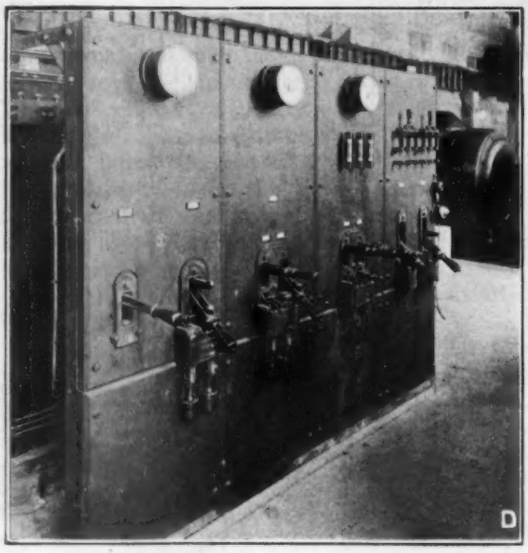


Only Equipment for Starting and Stopping Is in Operating Room—Control Apparatus Is in Control Room









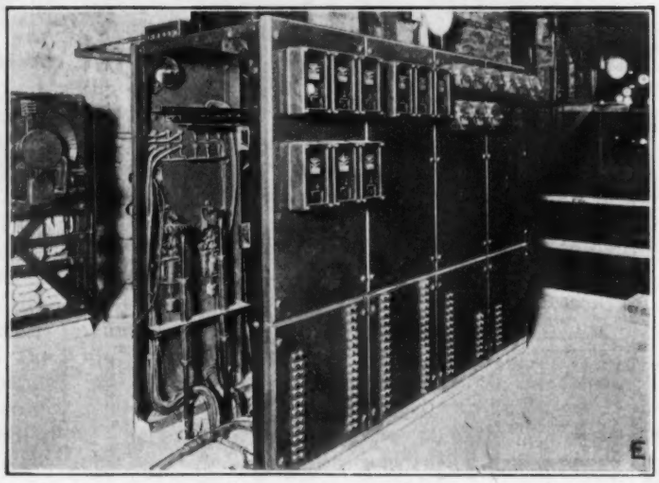


FIG. 2—SOME OF THE EQUIPMENT ON THE OPERATING GALLERY

A—Exciter-motor panelboard back to back with B, which carries field circuit breakers. C—General view of operating gallery. On it are the governor heads, motor-driven exciters, field circuit and station service panelboards and related equipment. D—Oil and governor fluid pump motors are controlled from this board. Back to back is E, station-service relay board.

The estimated weights of the principal parts in pounds are as follows:

	No. 16	No. 17	No. 18
Stator with core and windings	224,000	251,000	291,000
Rotor with shaft	271,000	311,000	318,000
Miscellaneous parts	90,000	53,000	41,000
Total	585,000	615,000	650,000

In each case the weight of the revolving part is carried by a Kingsbury thrust bearing mounted upon a massive spider on the top of the generator. These bearings are identical in all three machines.

Mica insulation was used for the armature windings of all three machines. Rotors were all designed for 100 per cent overspeed. Guaranteed efficiencies at normal load were 97 to 97.25 per cent and armature reactances not less than 18 per cent at maximum rating. The degree of uniformity of characteristics obtained by the three manufacturers is indicated by Fig. 5, which shows the saturation and short-circuit curves of the three machines.

Alternative Sources of Excitation

An individual motor-driven exciter is provided for each generator. The motors are 2,200 volt, three phase, 25 cycle, 750 r.p.m.; the exciters 220 volt, 225 kw. shunt wound, with series interpoles.

There are two alternative sources of supply for the exciter motors. (See the general wiring diagram.) One of these comes from a special 2,200-volt waterwheel-driven generator installed for this service; the other is connected through transformers to the 12,000-volt buses of Station 3. Provision is made for a third connection to the present 2,200-volt distribution circuits in Station 3 gate house.

As a further reserve, there is also an auxiliary field circuit connecting to the direct-current buses of Station 3, capable of supplying the field of any one of the three new machines through a single field rheostat and direct-current bus. A controller for this rheostat is placed on each generator-control board in the control room.

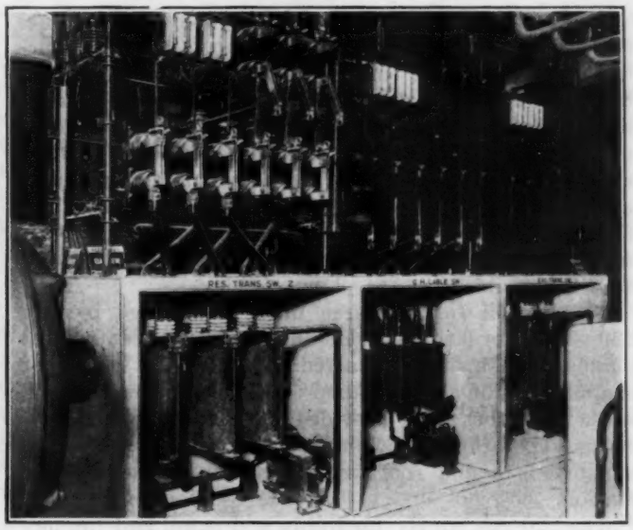
All of the exciter circuits with the exception of the motor-starting equipment are controlled from the control room at the top of the cliff back of the power house. The exciter motors are started from the unit switchboards on the gallery.

Eighteen Temperature Detectors in Each Generator

Each machine is equipped with eighteen embedded temperature detectors, whose leads are brought to terminals on the exciter switchboards, from which any six can be connected to temperature indicating devices in the control room. Cooling air is taken by the generators from the generating room at both top and bottom of the machine. The hot air discharging through the ventilating ducts is collected by a plate steel housing completely surrounding the generator frame and connecting to the inlet of a large motor-driven blower which exhausts the hot air, discharging it through a duct below the power house floor to an uptake leading to the outer air at the roof. Thus the hot air delivered from the generators is not permitted to enter the generator room. Means are provided, however, for recirculating any desired portion of this air during cold weather for the purpose of maintaining the temperature of the generator room at any desired point.

The generators are protected as to internal breakdowns by means of the Merz-Price system of relays operated from two sets of current transformers, one installed at the neutral point and one in the phase leads, these relays being arranged to trip the line and field circuit breakers simultaneously. Overcurrent relays are also provided to trip the line circuit breakers in case of short circuit. All relays are of the inverse definite time type.

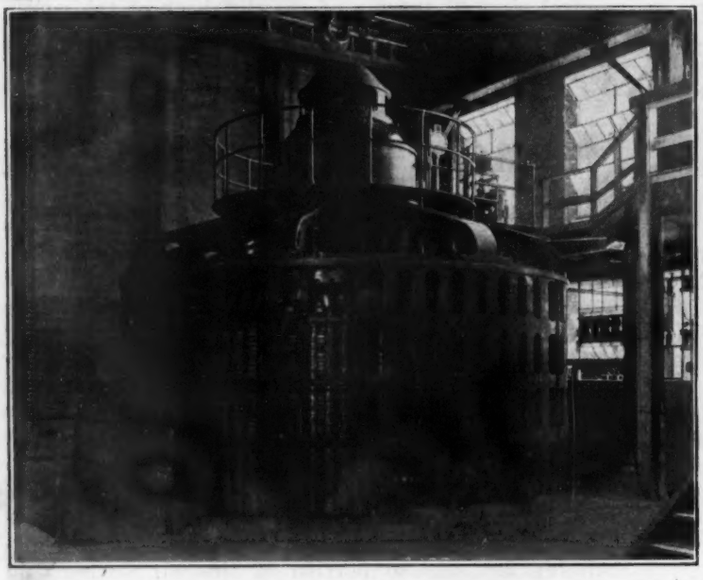
Alarm signals are arranged to give warning of the failure of oil or governor fluid supply or the supply of water for the lubrication of the lignum vitæ turbine bearing.

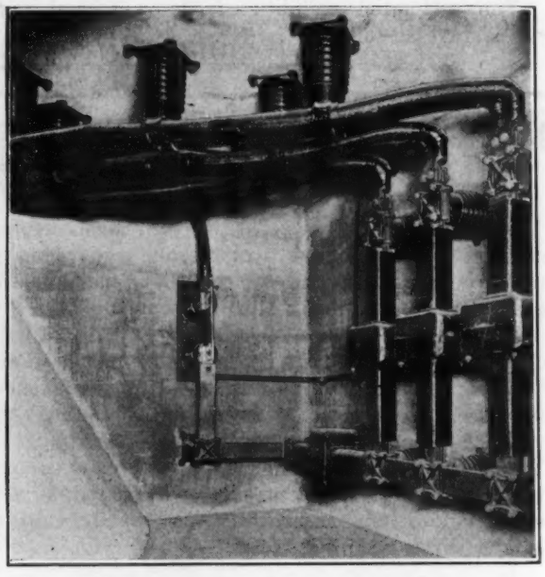


FIGS. 3 AND 4—END VIEW OF OPERATING GALLERY AND SECTION OF EQUIPMENT BELOW IT

Generator Auxiliaries

"Turbo-conoidal" ventilating fans made by the Buffalo Forge Company and rated at 90,000 cu.ft. per minute are directly connected through Franke flexible couplings to Allis-Chalmers 40-hp., 220-volt, 25-cycle, 288-r.p.m. induction motors. Starter handles are mounted upon the exciter switchboard on the gallery.





FIGS. 5 AND 6—METHOD OF CONDUCTING LEADS FROM GENERATORS

Six leads leave each generator. Three are phase leads running to the buses, while the other three are the opposite ends of each phase and go through current transformers under the floor and thence to a neutral grounding switch as shown at the right. These current transformers are for differential relay protection, and there is also another set in the phase leads.

There are three governor fluid pumps, centrifugal type, two of which are driven by 75-hp. 2,200-volt induction motors and the third by a 220-volt direct current motor. One of the alternating-current motors is manually started from the operating gallery. The second is equipped with automatic starting actuated by a float switch in the sump tank. The direct-current pump is also operated by a float switch adjusted to follow the automatic alternating-current pump. With these arrangements failure of governor fluid supply is practically impossible.

Bearing oil for all three units is handled by two 220-volt alternating-current motor-driven centrifugal pumps, both manually started. Provision is made for the addition of a third pump to be direct-current operated. Oil storage is provided sufficient for one hour normal operation of the entire plant, by means of tanks supported in the roof trusses above the generating station.

The 220-volt supply for lights and pump and fan motors is furnished either by a central bank of 100-kva. 2,200/220-volt transformers or by an individual bank of 15-kva. 2,200/220-volt transformers for each unit. Energy for lighting is distributed to panel boxes at 220 volts, single phase, a balancing coil of 1.5-kw. capacity being installed at each box to supply the 220/110-volt three-wire branches, all lamps being 110 volts.

From the terminals of the generators cables lead to the top of the cliff, where the wires enter a terminal building containing switching, metering and protective equipment and from which lead the overhead transmission lines. A control building, also located at the top of the cliff, houses the control switchboards, space being provided here for the control of possible future units and also for the control of the units in Station 3, which are now controlled from a switchboard in the old generating station.

TERMINAL BUILDING ON CLIFF ABOVE STATION

Owing to the fact that all of the power from the new generators was to be transmitted to a new substation at Echota (three miles distant), where complete paralleling arrangements were to be provided, it was not considered necessary to parallel the generators at the generating station, with the duplication of switching equipment and building involved therein. Each generator therefore feeds directly, without interconnection, to its own individual transmission line leading to the Echota substation, a single oil circuit breaker being interposed between the generator and the line. Arrangements are made for synchronizing at this breaker, but it is anticipated that the synchronizing will usually be done at the substation.

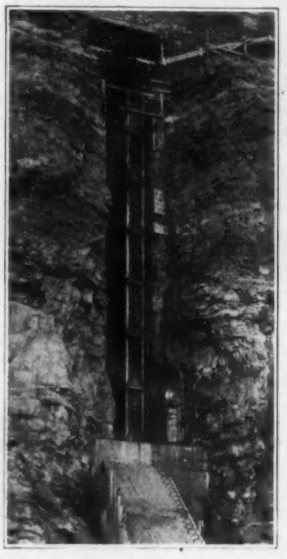


FIG. 7—CONTROL CABLES ARE RUN IN CONDUIT AS SHOWN

The terminal building is a long narrow structure located on the brink of the cliff above the generating station and was designed to house the generator oil switch and protective equipment, to serve as a terminal structure for the transmission lines and to form part of a future step-up transformer station.

On the first floor of the terminal building are installed current and potential transformers for metering purposes and the line circuit breaker. Choke coils and static absorbers for lightning protection occupy the second floor, and lightning arresters are situated on the roof. A somewhat unique feature of this installation is the location of the circuit breaker in an opening in the wall of the building in such a way that the tanks and mechanism communicate to the outside of the building, while the terminals and high potential connections are inside. This is primarily for protection against oil fires and explosions. The switch is a Westinghouse type CO-2,

the choke coils also being of Westinghouse construction. The static absorbers and lightning arresters were furnished by the General Electric Company, the latter being of the oxide-film type.

The main leads from the generators, after passing through the current transformers for the operation of differential relays, which are located in the basement of the generating station, enter 1,250,000 circ.mil, single-conductor, varnished-cambric insulated, lead-covered cables, two for each phase, leading to the power house roof. At this point the conductors emerge from the lead-covered cables and pass out of the building through bushings and connect to open wires leading to the terminal building at the top of the cliff. The lead-covered cables are installed in slots in the concrete construction of the power house, and where these slots are vertical the weight of the cable is supported by cast-iron wedges inserted between the cable and the sides of the slot, which for this purpose are provided with beveled pockets at intervals of 8 ft. This method of supporting vertical runs of cable has been very successfully used in the Hydraulic Power Company's previous installation.

The terminal building, at the top of the cliff, is constructed with a cantilever extending out over the edge of the cliff, forming a platform, to the under side of which are attached the open wires leading up from the power house. From this point the leads enter the terminal building through bushings under the overhanging platform. The open wiring between the power house and terminal building is supported on suspension-type strain insulators and is protected against lightning by overhead ground wires. Provision will be made for circulating low-voltage current through these ground wires in winter to prevent the accumulation of sleet.

ARRANGEMENTS FOR CONTROL WIRE RUNS

The control wires from the power house apparatus are first brought to link terminals mounted upon the exciter switchboard on the power house gallery. From this point multiple-conductor control cables carry the control wires to similar terminals on the relay boards in the control building. The control wire passage, which joins the rear power house wall at the level of the roof trusses, is of concrete, built upon the sloping rock surface between the power house and the bottom of an old tailrace shaft which is used to carry the control wiring up the cliff. In this control-wire passage and shaft the cables are inclosed in steel conduit, which, in the vertical portion, is clamped to a steel tower. This tower is supported from the bottom and is free from the side walls of the shaft in order to protect the cables against seepage. A stone wall has been erected across the open side of this shaft, which originally was merely a slot in the vertical face of the cliff.

From the top of the shaft the control wires are carried on steel work through existing excavation to the basement of the control building and thence to terminals upon the relay boards above described. An underground passage also leads to the terminal building. These passages will be utilized both for control wiring and as a subway connecting the control and terminal buildings.

Wherever the concentration of control wiring would result in congestion if placed in conduit the control wiring is carried in steel pans or troughs, arranged one above another, each pan being assigned to an individual unit. In this manner the congestion of conduit, so often seen in power plant construction, is entirely avoided, with, at the same time, a distinct gain in accessibility. Wherever necessary for protection, or where the use of the pan construction is undesirable, control wires are carried in steel conduit. Control wiring is made up in cables of seven to fifteen conductors, each conductor being covered with rubber and cotton braid, the cable being covered with flame-proof braid. No lead sheaths were used on the control cables.

NEW CONTROL BUILDING FOR ENTIRE PLANT

The control building is located upon the brink of the cliff, overlooking the lower gorge, at a point immediately above the junction of the old and new generating stations, where it is most conveniently situated to control both the old and new plants. The building stands directly over the discharge from the ice gates of Station 3, and use was made of some old waterways, dating from days prior to the art of electrical generation, for control wire passages to the generating and terminal stations.

The main generator control switchboards, which are located in the control building, are of the utmost sim-

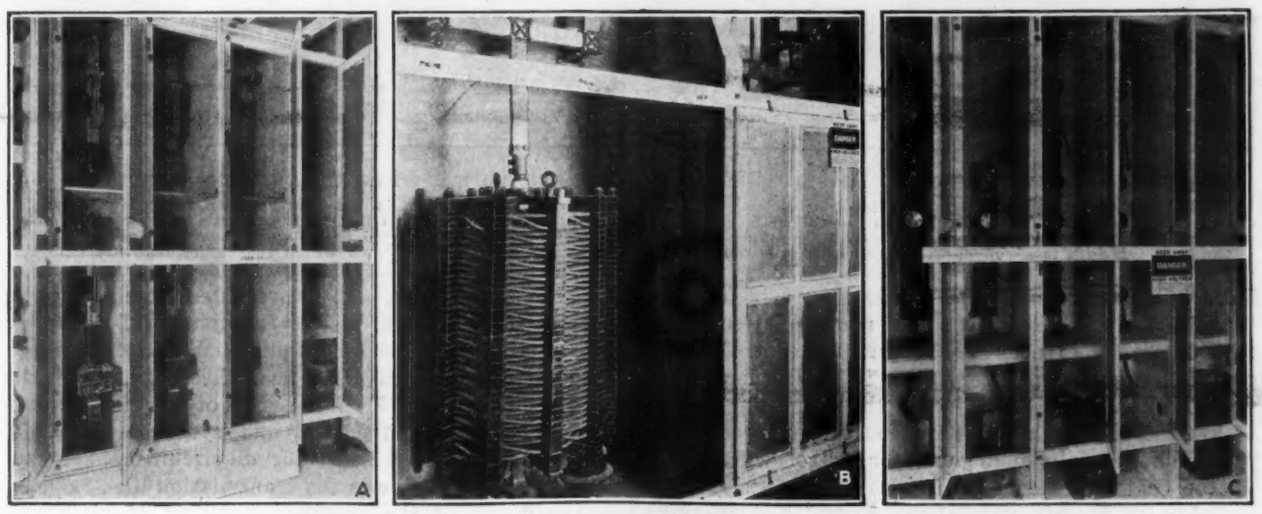


FIG. 8—CELL CONSTRUCTION INSIDE TERMINAL BUILDING ON CLIFF ABOVE STATION

A—Current transformer compartment. Observe that the compartment doors are hinged and those in same phase group are attached to bar so that when oil switches are closed the doors cannot be opened, and hence the maximum protection is afforded workmen. B—One of the choke coils in the generator circuit. C—Potential transformer compartment.

plicity. Vertical panels are used, of natural, dull-finished black "Linstun." Each unit control consists of three panels, one containing the voltage regulators and temperature indicating devices, the second the main generator instruments and control switches for 2,200-volt exciter-motor circuits and governor speed control, and the third, the generating station signal system and control switch for the line circuit breaker. The boards are arranged upon a circular arc, space being provided both for considerable extension of the new station and for the entire control of the old, which it is intended ultimately to relocate at this point.

On the lower floor of the control building, directly beneath the generator control boards, are panels for control wire terminals, relays and recording instruments. Here are also mounted the exciter rheostats operated from the control boards above. A storage battery rated at 120 amp.-hr. capacity at 220 volts for control circuit operation occupies a battery room in one corner of this floor, and immediately adjacent thereto is installed a 16-kw. motor generator set for charging purposes.

In addition to the main generator control switchboards in the control room there is also a six-panel service switchboard for storage battery control and charging and for direct-current control and alternating-current lighting and heating circuits in the control and terminal buildings and a three-panel board for the control of the 2,200-volt circuits for the supply of power for excitation and service in the generating station. All switchboards were furnished by the Westinghouse Electric & Manufacturing Company, after plans and specifications of the power company.

From the foregoing description it will be noted that the entire control of both main generator and exciter circuits, with the sole exception of the exciter motor-starting equipment, is in the hands of the control room operator. First, he may select the source of 2,200-volt power for excitation, *i.e.*, 2,200-volt generator, Station 3 bus, or gate-house service bus. Second, he may select the source of power for driving the exciter for each generator, *i.e.*, exciter bus or reserve bus. Third, he may select the source of direct-current power for each generator field, *i.e.*, individual exciter or direct-current bus. Fourth, he has full control of generator fields, either through the individual exciter field or through the common main field rheostat, and of the field switch. Fifth, he has control of the turbine governor for varying the load and synchronizing, and, finally, of the main generator oil-circuit-breaker connecting the generator to the transmission line.

The duties of the generating station operator are, therefore, confined to starting and stopping the apparatus and attention to its proper mechanical operation, on which function he is able to concentrate his attention.

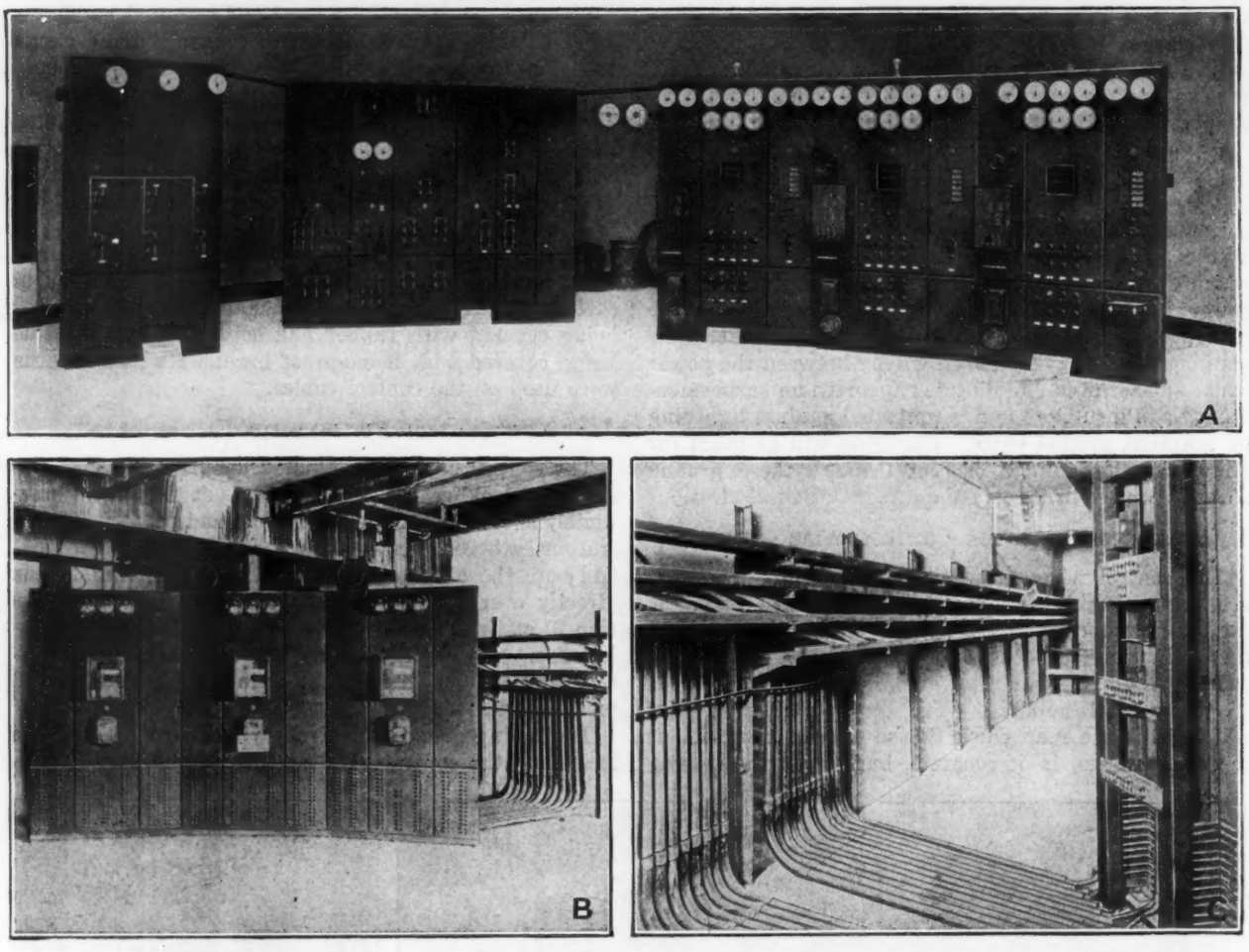


FIG. 9—SIMPLICITY OF LAYOUT AND ACCESSIBILITY OF EQUIPMENT ARE EVIDENT IN DESIGN OF CONTROL HOUSE

A—Main control room showing oil-switch control levers, instruments for operating units, signal apparatus, Tirrill regulators and annunciators which indicate location of trouble. On the left side of the desk is a roll chart on which are plotted station-log. Below this room is the board shown in B, which carries relays and recording and integrating meters. The cables coming to this board are supported in troughs along the walls, as shown in C. Back of the panels to which the cables lead are conduits.

Strengthening the Utilities*

Co-operation Among Public Service Corporations, Commissions and Investment Bankers Will Promote Company Welfare—Regulation Has Justified Itself—The Banker's Part—Public Willingness to Invest Growing

By CARL D. JACKSON
Chairman Wisconsin Railroad Commission

IT HAS taken many years and the vast economic changes of the world war to bring to full public realization the simple fact that the true relationship between the public and the public utilities is reciprocal in its nature, demanding not only the public right to adequate and efficient service at reasonable cost, but also adequate return to insure the utility stability, prosperity and credit, without which it cannot long perform its public functions. For the last four years we have been passing through revolutionary economic conditions from which public utilities were no more exempt than was any other field of business endeavor. This resulted in emergency conditions that were treated often as such, but as it became clear that the conditions arising out of the war would not be overcome for many years, if ever, and that revolutionary economic changes had actually taken place, the utility commissions, in general, throughout the country endeavored frankly to meet the situation. This has been an enormous task. The work is still being prosecuted, but sufficient has, in my opinion, already been accomplished fully to justify commission regulation and assure its continuance as a matter of wise public policy in the public interest. Not only have the commissions had to meet the greatly increased expenses strictly operative in their nature, but they have had to provide rates which will meet the increased fixed charges for taxation and for the higher interest rates now prevailing for new capital.

The regulatory commissions have been well aware of this condition. I believe they can be relied upon to meet the situation frankly and wisely. I believe that on the whole regulation has justified itself and has come to stay. It is wholly in the public interest that utility problems should be dealt with in a broad spirit, with full recognition of economic laws and social conditions. State commissions have the machinery for this work and bring to the problem a close knowledge of local conditions and a staff equipped for broad study and scientific investigation.

But the responsibility for the prosperity and continued development of utilities by no means rests alone upon commissions and regulatory bodies. Commissions are established by the mandate of the people and their continued existence depends upon the consent of the people. In the long run the public must approve and acquiesce in commission regulation if it is to continue. This means that commission action must reach a high standard of economic and social usefulness and the public must understand that this is so. Utility managers and investment bankers must co-operate to make regulation a success not only for investors but for the consuming public, who also must be able to see the advantages coming from that regulation. The benefit both to the public and the utility must be mutual if the system of regulation properly functions.

First in importance along this line besides the question of reasonable rates is the matter of public relations and service. I believe that more and more those active in the public utility field have come to realize their prime

How the Commissions View Their Responsibility

IN SUPPORT of the view that regulation of utilities by public service commissions has been justified by its results, Mr. Jackson made a number of citations from utility decisions. These were selected at random and could be paralleled in almost every state. The following excerpts from the citations exemplify their spirit:

The public is the first to suffer from inadequate service. The city cannot continue to grow to advantage unless the utility system continues to grow as well and keeps abreast in all respects with the community which it serves.—*Maryland Commission.*

It must be borne in mind that to give proper and satisfactory service a company must receive sufficient revenue to meet the demands made upon it. If it fails in this respect, some one must suffer. It may be the stockholders and it may be the public. This should not be the case. Both should be properly provided for, the public by having good service and the stockholder by having a fair return upon his investment.—*New York Commission, Second District.*

It is time to realize that good service can be obtained only by just and equitable treatment of the utilities.—*Oregon Commission.*

Anything which interferes with the attraction of capital to a public utility handicaps the development of the territory served. That to increase rates enough to attract capital will increase the cost of living is in a measure true, but the refusal to grant sufficient rates is 'penny wise and pound foolish' and inadequate service will result, which, through indirect costs, will increase the cost of living many times the increase necessary to attract capital.—*New Jersey Commission.*

A publicly regulated monopoly is helpless in times of mounting costs unless it is given relief by the regulatory authority.—*Virginia Commission.*

It is vitally necessary for the continued growth and prosperity of the vast territory in southern California supplied by applicant with electrical energy that its full program of development go forward without serious interruption. We believe it in the interest of the consumers that they pay rates sufficiently reasonable to enable the company to earn a fair and reasonable return upon the actual investment. Unless this is done it is plain that the utility cannot borrow sufficient funds to carry forward the necessary developments.—*California Commission.*

*Part of an address delivered before the American Investment Bankers' Association at Boston on Oct. 5, 1920.

obligation in the matter of service. Good service is one of the keys that will unlock the door to public confidence and public approval. It will lighten your burdens in the performance of your function of financing. It will vastly lighten the burden of regulatory bodies in their field.

It would be well if every one would learn that the owners of public utilities cannot be looked upon or mentally segregated as a class distinct and apart from the general public. The owners are the public. It is the innumerable individual investors and the entire public represented through banks, insurance companies and trust companies that have actually supplied the investment and money to create these utilities. From any point of view, therefore, public utilities are public in every sense of the term, a fact often not realized by the very owners of these utilities.

On the whole, I believe that the time is not very distant when the public will again be glad to have recourse to safe and stable public utility securities for investment. The future of such utility securities appears, generally speaking, to be bright and should be faced in a spirit of optimism.

RELATIONS BETWEEN COMMISSIONS, UTILITIES AND BANKERS

You will pardon me if I have the temerity to make some suggestions upon the relationship which should prevail between the regulating commissions, the utilities and yourselves as representative both of the investing and consuming public. The successful development of public utilities and their ability to meet the ever-growing public needs and demands depends not alone on wise and public-spirited management of the public utilities and fair treatment by their regulatory bodies, but is also dependent upon the securing of capital for this necessary development and expansion, and that capital can be secured from the investing public economically and efficiently under present conditions only through investment bankers.

The investment in a public utility is not intended to be nor is it generally amortized. From time to time therefore the underlying issues mature and must be refinanced. Before the present financial stringency and before the partial impairment of public utility credit a large proportion of the investment was in the underlying securities, usually running for long terms of years. During the war period much of the financing has been on short-term notes at very heavy expense, both in interest rates and commissions, and these, of course, must be taken care of in the next few years. The greatest demand, however, will arise from the necessity of securing new capital for expansion and better service in all classes of utilities. The railroads, if they are to function properly and meet the great transportation needs of this country, will absorb several billion dollars. Utilities have not kept pace with the increased growth of cities and communities, and it has been estimated by those familiar with the utility situation that somewhere in the neighborhood of one billion dollars a year will be required if the utilities are to expand and properly perform their public functions and meet the public demands. New investment at this rate will probably be necessary for four or five years. Assuming, therefore, that it is reasonable to anticipate that the consuming public, which to a large extent is also the investing public, will fully realize the necessity for placing the credit of public utilities upon a firm basis, and that the public utilities as a whole may be assured of fair treatment, the problem is not solved without the complete co-operation of those organizations represented by yourselves and especially established for the purpose of securing the necessary capital for the legitimate and proper development of the country.

I note that at times those engaged in the business of investment banking refer to themselves as "security merchandisers." I trust you will pardon me if I suggest that I do not think this definition of your occupation properly expresses the ideals or ultimate objects of investment bankers. While it is a fact that you are merchandisers of securities, it appears to me that you are also, and especially in relation to public utilities, performing a quasi-public duty with certain quasi-public obligations. So far as the public utilities at least are concerned, the responsibility for financing is not a mere present one, but one that must be with you in the future. It is a responsibility that will be with the investment bankers for all time so far as we can see. Utility regulation cannot be successful without the co-operation of utility management. Neither can it in the long run be successful without the sympathetic co-operation of investment bankers. This can be accomplished much more easily and successfully if the investment bankers will discourage any attitude that their functions are merely related to a specific series of securities and assume that their duty is also to assist the commissions in endeavoring to bring about a sound financial basis of the utility which will look toward its future prosperity and possibilities.

A large part of the financing can be most easily accomplished through the issuance of primarily secured bonds. If a proper ratio between total investment and the secured investment is maintained, not only is a large part of the money obtained for the enterprise at the lowest possible rate of interest (sound investment rates) but the stock financing will be encouraged and the rewards will be increased to those who have taken the greater risk of unsecured issues. This will make it possible to attract further capital in stock issues and adequately maintain that relationship between secured and unsecured issues which alone can assure future growth. The most discouraging situation in the public utility field is found in those instances where only the bonds, and those at high interest rates, will be accepted by the investing public. Such a condition is inimical to future growth. If holding companies are in themselves unwilling to maintain the proper margin of equity by further investment in capital stock, they should then give the public a chance to share in that stock, which is often very attractive.

REWARDS SHOULD COME FROM OPERATION

The rewards for utility enterprise should be found wholly in the results of operation. I believe it the plain duty of investment bankers to discourage absolutely the financing of public utilities where the rewards are not to be gained from operation and from public service but are attempted to be secured through financing itself. While temporarily there may be more than ordinary profits in this sort of financing, there is also a direct assurance of future trouble for the real investors, the utility and the public.

In spite of the revolutionary times through which we are passing, which have threatened at times the

credit of many of the soundest public utilities in the country, it may be safely said that the utilities are in general weathering the storm and on the road to more prosperous conditions. Many of the utilities are today on as sound or a sounder basis than in pre-war times. This may not be so in general, but that is unquestionably the trend of the times, especially so where regulation has been able to meet the situation. While there are exceptions to this rule, especially in some of the larger cities and where the matter has become a question of politics rather than a question of business and public good, these exceptions do not represent the trend as a whole. The time is also rapidly approaching when wildcat or speculative schemes for enormous profit with no security will not attract the ordinary investor.

POPULAR SPIRIT OF INVESTMENT GROWING

It is not to be overlooked either that the spirit of investment is growing among the people. Liberty bond investment has taught many of them to invest who never before considered this matter. The public utilities themselves under the stress of the war were in many instances obliged to go directly to the people with preferred stock and other securities in order to weather the financial stringency. I am told that in the electrical field alone there are 1,200,000 individual investors—a greater number of investors than can be found in any other field.

Utility development must meet with sympathetic encouragement from the people. This is a field in which the investment bankers can assert a very great influence for the public good. They can assist the public in coming to understand the problem and the situation. They can make the situation easier for the utility and for the commissions. At the same time, the benefit which will come from a better public understanding of the problem and situation will not only be for the benefit of the utility and for the general good but will be in the interest of the investment bankers themselves. The public also should come to learn that regulation is an assurance of stability, that the hazard is perhaps at a minimum and that the safety of the better investments is only exceeded by that of government securities.

The solution of all problems connected with public utilities is one to be reached by the utilities, the utility commissions and the investment bankers. All matters connected with the problems must be handled in a co-operative spirit and one which will appeal not only to the consuming public but to the investing public, and for my part I think that I can freely assure you that the utility commissions will welcome your wholehearted co-operation.

Languages Eliminated from Engineering School Curricula

IN ORDER to devote more time to technical matters the faculty of the California Institute of Technology, at Pasadena, has eliminated modern languages from the required curricula of the engineering classes. Under the new program students may take special courses in languages if they desire, but the hours that were formerly devoted to such subjects have been given to electricity and kindred matters. English and current topics will also be insisted upon more than previously. The departure was made, it is said, after consultation between the faculty and technical authorities.

Readers' Views and Comments

Interconnection with Industrial Plants

To the Editor of the ELECTRICAL WORLD:

SIR: The interconnection of industrial plants and power companies to conserve fuel and money offers possibilities well worth thorough investigation. The smaller and more uneconomical plant can often purchase power to better advantage than to attempt to generate it. The use of steam for process purposes will modify conditions and each case must be considered on its merits. The large power consumer, however, presents a different case, and where interconnection is advantageous one of three classifications will apply:

(1) The industrial plant should purchase all or a portion of its power from the power company.

(2) The industrial plant has surplus power to sell at certain periods while it may or may not purchase power at certain other periods.

(3) The industrial plant has excess power to sell at all times.

In order to make an attractive contract agreement the manufacturer must be able to furnish power at a price to compare favorably with that generated by the central station. This may be accomplished in several ways. The load factor may be so high that the kilowatt-hour cost is comparable even though the generating units are not so economical. Many industrial plants operate with hydro-electric power and are in a position to compete on price with power companies.

The greatest opportunities in this line would appear to be in those industries in which waste heat can be utilized for generating excess power. In the smelting and working of iron, steel, copper and other metals, in the manufacture of Portland cement and in many other industries large quantities of waste heat can be developed. Where these developments have been made they have covered only the requirements of the industrial plant. By the installation of more complete apparatus for the recovery of the heat and by larger and more efficient generating units large blocks of power can be made available at low cost. This power can be wholesaled to power companies for distribution.

The installation of waste-heat boilers in connection with industrial processes involves modification in operating methods. These require careful planning and close co-operation with the operating forces. A properly designed plant, operated under careful supervision, will usually give beneficial results from both the manufacturing and power departments.

Under existing conditions of finance among the utility companies it is possible that the installations can be financed more readily by the industrial companies. A careful analysis should be made by competent engineers in order to obtain the utmost benefits to both parties. In some cases a mutual benefit will result from a change in status of a few large consumers to producers of power. This should not work a hardship in view of the present shortage of power supply.

El Paso, Tex. T. H. ARNOLD.

Station and Operating Practice

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

Exploring Coil Outfit Locates Grounds on Distribution Circuits

AN EXPLORING coil outfit such as that shown in the accompanying photograph provides a simple and reliable means of quickly locating accidental grounds on low-voltage overhead circuits. The outfit consists of an exploring coil, a reactance coil and a pair of head telephones such as are used in wireless telegraphy. The exploring coil is made by winding 5,000 turns of No. 36 wire on an ordinary wooden bicycle rim. The reactance coil consists of 600 turns of No. 15 magnet wire wound on a laminated iron core having a closed magnetic circuit of 6 sq.in. (38.7 sq.cm.) cross-section. Taps are brought out about every 100 turns so that the current may be varied. Connections are made as shown in Fig. 2, and a tap is selected on the reactance coil that will allow about 5 amp. to circulate through the ground to be located.

If the circuit is normally ungrounded, a temporary ground connection must be made. If the circuit has a number of ground wires, they must be disconnected from ground while making the test. The receivers are placed on the head and the exploring coil is held with its plane parallel to the circuit. With the coil in this position a distinct humming or singing sound is heard. This sound is generally of a high pitch and is produced by the harmonics in the magnetizing current of the reactance coil.

In the case of an overhead line the tester then walks

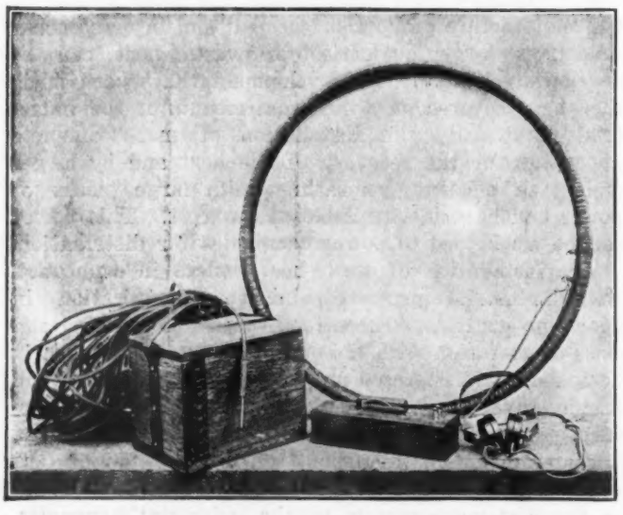


FIG. 1—EXPLORING COILS AND REACTANCE USED FOR LOCATING GROUNDS

along the line until the hum ceases and he knows that the ground is on some customer's premise feeding off the pole at this point.

After the tester has located the service carrying the ground current, the small exploring coil shown in the picture is used inside the building on the various branch circuits to locate the circuit where the trouble exists.

To locate grounds on direct-current circuits, if a source of alternating current is not available, an interrupter is substituted for the reactance and direct current is used instead of the alternating current.

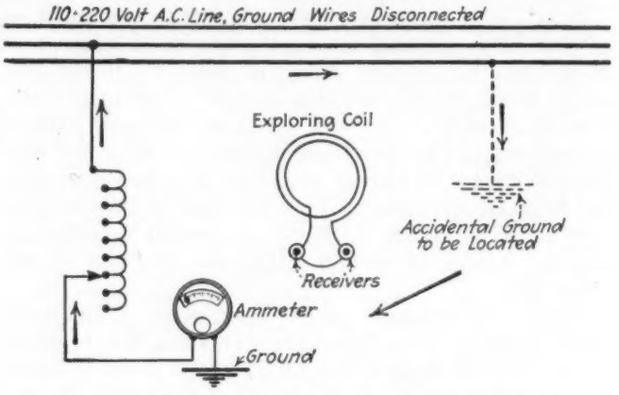


FIG. 2—CONNECTION FOR LOCATING GROUND ON DISTRIBUTION CIRCUIT

This outfit is particularly valuable in locating accidental grounds on secondary circuits where it is desired permanently to ground the transformer. It can also be used to locate underground pipes and other metallic structures.

W. C. HESTON,
Industrial Power Engineer.
Portland Railway Light & Power Company,
Portland, Ore.

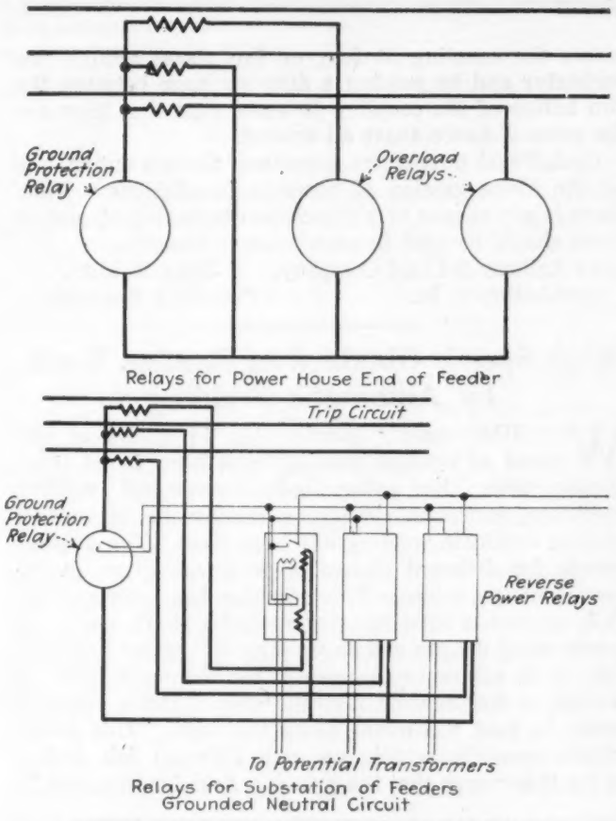
Special Relay Permits Use of High Resistance in Neutral Grounds

THE use of high resistance in neutral grounds has become possible through the development of a special ground relay which will operate on a much lower current value than regular overload relays. Resistance is ordinarily used of so low a value that a ground causes operation of the overload relays. Systems using these ground relays have been successfully operated when they are set for current values of 10 per cent to 20 per cent of that for which the main relays are adjusted. For example, in a certain 6,600-volt circuit with protection dependent entirely upon overload relays set at 100 amp. more than 38 ohms could not be put into the neutral as more resistance than this would not permit sufficient current to flow in case of a ground to operate the overload relays.

For safety it was necessary to reduce the resistance to half that value to make sure that no ground could occur without tripping the overload relays. With

the system illustrated the ground relay was set for 10 amp., which allows the use of 100 ohms in the neutral and yet will pass sufficient current under conditions of a higher resistance accidental ground to operate the ground relay.

Three current transformers at the power house end give complete protection, while two would leave a chance that a ground occurring on one leg would not operate the



GROUND RELAY OPERATES AT LOW CURRENT VALUE

relay. With this system there are two overload relays which give protection against short circuit and the third relay gives selective action and fast tripping will take place on grounds. The current setting of the third relay places the limit which must be put upon the ground-line resistance.

At the substation end of the line three ordinary reverse-power relays and one ground-protection relay are used as shown. The reverse power relays have two independent elements with contacts in series. The upper element is a watt relay and closes its contacts on any reversal of power; the lower element is a current relay and closes its contact when a given current flows irrespective of direction. Both elements must operate in order to trip the breaker, the upper element giving directional selection and the lower giving current selection. The fourth relay is a low-current relay similar to the one at the powerhouse end. Its contacts bridge the contacts of the lower elements of the reverse-power relays and therefore take the place of the lower element when a ground occurs.

This system can be applied on systems both with multiple power stations and with multiple substations.

A. W. COPLEY,
General Engineer.
Westinghouse Electric & Manufacturing Company,
East Pittsburgh, Pa.

Trailer Reduces Central Station's Hauling Expense

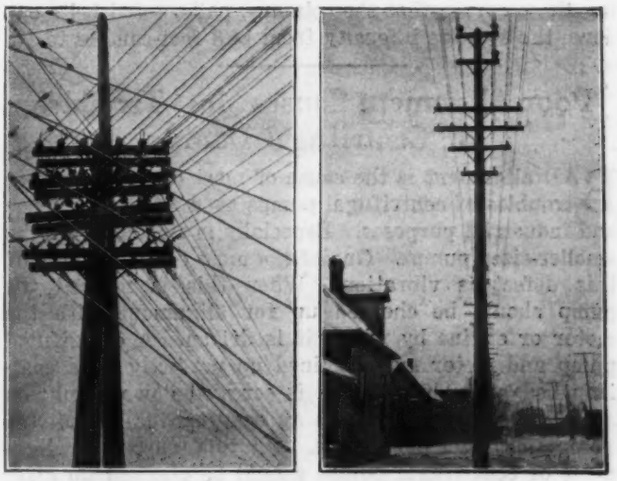
THE usefulness of autotrucks for hauling heavy and bulky central-station apparatus has been greatly increased by the purchase of a 6-ton trailer by an Illinois company for special hauling jobs. The trailer has been the means of reducing the number of special truck trips almost 50 per cent. The company operates in a number of towns fairly close to each other, and in many instances it has been found to require only two or three more truck hours to ship by truck direct than it would to send by freight with truck delivery at each end. The trailer greatly increases the economic possibilities of these through truck shipments.

The trailer has also proved useful for moving heavy machinery, poles, etc., where unloading facilities are not available. The load is simply left on the trailer and the truck is free to do other work until the trailer is unloaded. No difficulty has been experienced in loading twenty-five 35-ft. (10.5-m.) poles on the trailer. The first layer of poles is laid with the butts slightly overhanging the front end of the trailer body but clearing the rear end of the truck so as not to cause interference in turning. The succeeding layers of poles are then above the truck so they are allowed to overhang the truck body about 4 ft. or 5 ft. (1.2 m. or 1.5 m.).

This size of trailer was decided upon because it was large enough to haul heavy transformers, motors and other generating and substation equipment and was not too heavy for hauling light, bulky loads. The trailer can be loaded up to and above its rated capacity on level paved roads when drawn by a 2-ton truck, but on soft roads and in hilly country a larger truck should be used or a smaller trailer load carried. It is not necessary to have any one on the trailer to steer as it tracks with the trucks. The trailer is coupled to the truck by means of a pintle hook such as used by the United States army.

G. GENUNG,
Inspector of Transportation Equipment.
Public Service Company of Northern Illinois.

Safety Considerations in Line Construction



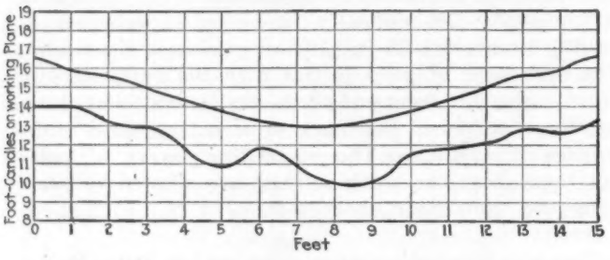
Ample climbing space is provided in the line on the right, while that on the left has scant space for the linemen to climb. The difference between proper and improper vertical clearance between cross-arms is also shown.

Industrial Applications

The Economical Utilization of Electrical Energy in Mills and Factories, Together with Practical Details of Installation, Control, Testing and Repair of Equipment Required

Lighting Efficiency Decreased 20 per Cent by Pulleys and Columns

LIGHT lost by interference of belts and pulleys was found to be about 20 per cent of the theoretical output of the lamps in the motor plant of the Oakland Motor Car Company, Pontiac, Mich. The lighting equipment consists of twelve 300-watt bowl-enameled type



ACTUAL AND THEORETICAL LIGHT DISTRIBUTION IN AUTOMOBILE PLANT

Upper Curve—Theoretical distribution of light from twelve 300-watt lamps without interference. Lower Curve—Actual distribution with belt and column interference.

C lamps mounted in R. L. M. reflectors 13 ft. 4 in. above the working plane and spaced 13 ft. 4 in. x 15 ft. (4 m. x 5 m.) in a rectangle three lamps wide and four long.

Illumination intensities were measured at each foot on a line between the two most central lamps, which were 15 ft. apart. These intensities were first calculated from the manufacturer's distribution curves, the values being shown by the top curve of the accompanying drawing. The actual distribution as found by measurement with a foot-candle meter with all lights burning is shown in the lower curve. It is seen by comparing these curves that the columns, pulleys and belts cut down the average intensity from 14.8 foot-candles to 12.

Poor Alignment Causes Most Troubles of Centrifugal Pumps

BAD alignment is the cause of most of the operating troubles of centrifugal pumps used for power-house and industrial purposes. Especially is this true for the smaller-sized pumps. One of the most common signs of this defect is vibration. When this is noticed the pump should be checked up for alignment with the motor or engine by which it is driven. A centrifugal pump and motor may be lined up perfectly on a cast-iron bed plate, but if this is screwed down firmly on an uneven foundation it is an easy matter to pull the pump and motor out of line. For this reason the alignment of centrifugal pumps should be checked up after they are bolted down in position, even if they were in line when there was no strain on the bed plate. The alignment can be checked by placing a straight-edge across the coupling at four or five places around the perimeter and by passing a distance gage between the two halves of the coupling to make sure that they are the same distance apart all around.

Centrifugal pumps are sometimes thrown out of line by the disintegration of concrete foundations. When there is any chance of a foundation becoming oil-soaked stone should be used in preference to concrete.

Iowa Railway & Light Company, Marshalltown, Ia. — JOHN M. MAY, Traveling Engineer.

High Speeds Obtained in Routine Work by Automatic Welding

WELDING speeds considerably in excess of the speed of manual welding have been found practicable with the automatic-feed type of welding machines, particularly where a considerable amount of routine duplicate welding has been done. The average speeds for different classes of work are given in the accompanying tables. This machine has been successfully applied to building up worn motor shafts and worn crane-wheel flanges and to welding the seams of tanks, etc. It is necessary to move either the material to be welded or the welding machine at a uniform speed in order to feed the metal along the weld. This necessitates specially setting up each different job, and it is for this reason that the principle field for the machine

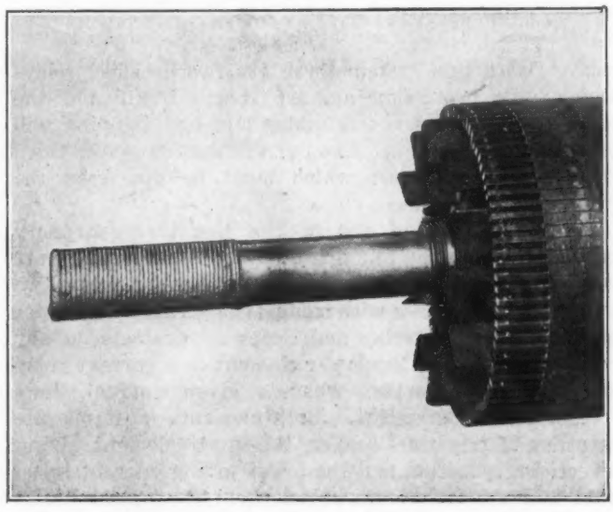


FIG. 1—WORN SHAFT OF MOTOR BUILT UP BY AUTOMATIC ARC WELDING

is where a continuous repetition of duplicate welds is required.

In case straight seams are required a lathe or planer is used to carry the weld along, and for circular work a lathe or boring mill is used. In some cases clamping jigs are employed to hold the work and to

facilitate putting it in position and removing it. Another use where the machine has proved economical is on large jobs such as that of reclaiming a 14-in. (36-cm.) shaft by building up ⅜ in. (1 cm.) of metal. This shaft had been inadvertently machined too small for its flywheel, and it was therefore built up to size.

It was 14 in. (36 cm.) in diameter, and the seat was about 21 in. (54 cm.) long. About ⅛ in. (5 mm.) of metal was deposited on this seat in one layer and in one continuous operation. The flywheel seat was later machined to the proper diameter. The welding figures are as follows: Current, 190 amp.; arc voltage, 18; electrode, ⅛-in. (3-mm.) diameter; travel, 4 in. (10 cm.) per minute; rate of deposition, about 4 lb. (18 kg.) per hour. Time required: Welding, sixteen hours; machining, four hours.

WELDING SPEEDS OF AUTOMATIC ARC WELDING

SEAM WELDING

Thickness of Material, In.	Amp.	Speed, In. per Minute
0.04	45 to 50	20 to 30
1/16	50 to 80	15 to 25
¼	80 to 120	6 to 12
3/16	100 to 150	4 to 6

BUILDING UP (WHEELS OR SHAFTS)

Diameter or Thickness, In.	Electrode Diameter, In.	Amp.	Speed, In. per Minute	Lb. Deposited per Hour
Up to 1	1/16	60 to 90	11 to 13	1.04—1.56
1 to 3	3/32	90 to 120	6 to 8	1.59—2.1
Over 3	⅛	120 to 200	4 to 6	2.5 —4.5

In reclaiming worn motor shafts, pulley and pinion seats and bearings are built up without removing the armature and usually without taking off the windings. In welding pinion or pulley seats the keyway is first filled either by hand-depositing or by welding in place a section of metal, after which the entire seat is covered (Fig. 1). Worn flanges on cranes may also be repaired. In the case of the 22-in. (55-cm.) wheel shown in Fig. 2 the actual welding time was two hours, compared with twelve hours for hand welding. A comparison of welding on smaller objects where jigs were used showed that welding the straight seams on ten small oil-switch tanks required two hours with the machine against four hours and forty minutes by hand.

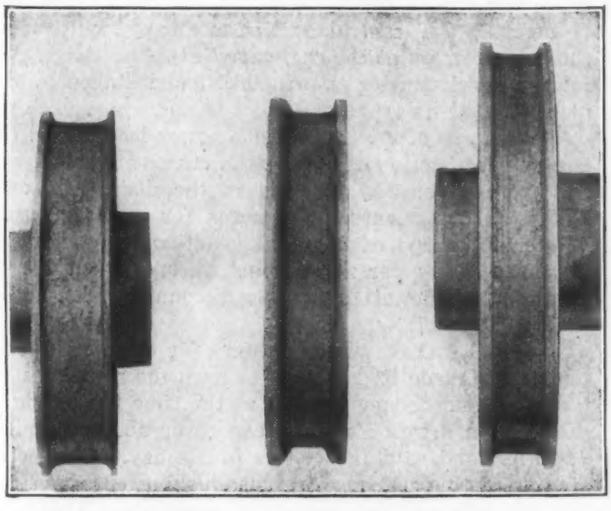


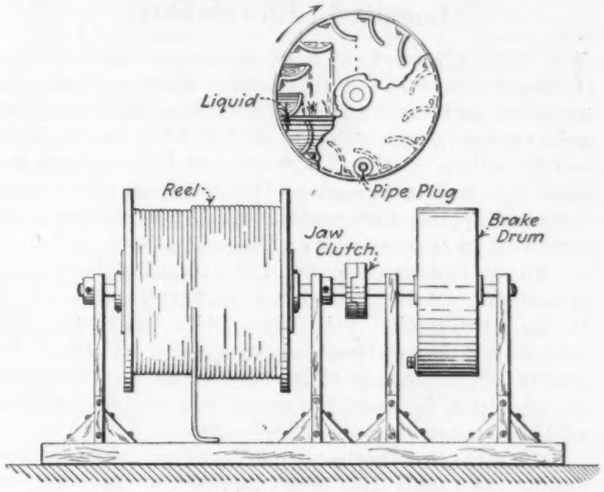
FIG. 2—CRANE-WHEEL FLANGES REPAIRED IN TWO HOURS BY AUTOMATIC ARC WELDING

Schenectady, N. Y. H. L. UNLAND.

Elastic Brake for Unreeling Wire

TO OVERCOME the difficulty experienced with most friction brakes used to maintain a tension on wire while being unreeled for the purpose of winding electrical devices the writer has designed and used a water brake, similar to the one illustrated in this article, which not only maintains a uniform tension but will also take up slack when more wire is unreeled than is required at the moment.

The brake consists essentially of a galvanized-steel drum into which are fastened curved buckets as shown.



LIQUID BRAKE FOR WIRE REEL

The braking effect depends upon the kind and amount of liquid placed in the brake drum. The liquid is lifted into the bucket in such a manner as to afford an eccentric loading of the drum at all times for a given direction of rotation. Should a sudden pull on the wire cause the reel to turn further than desired, and thereby produce slack, the brake will cause a reversal of rotation and again tighten the wire.

Old grain elevator buckets about 2½ in. x 2½ in. (65 cm. x 65 cm.) were used in this particular case, and the drum was 2 ft. in diameter by about 3 in. wide (56 cm. x 7.5 cm.). A ½-in. (12-mm.) pipe with suitable flange arrangement was used for a shaft, and a pin served to couple the brake to the reel shaft. A plug near the circumference of the drum is used for filling or removing the liquid. Water is used in the brake drum for wires up to about No. 12 B. & S. (3.31 sq.mm.). For heavier wire the brake should be filled with lead shot mixed with oil. This gives the brake a much wider range and permits a smaller-sized brake drum to be used for a given-sized wire. Adjustment of the tension is accomplished by adding or removing the liquid through the plug. The same design of brake can be used for unreeling textile goods, cotton, silk and heavy cables.

Vaughn & Meyer, Milwaukee, Wis. CORNELIUS G. WEBER.

Dust on Lighting Fixtures Reduces Light 25 per Cent

WHEN figuring on the installation of new lighting equipment it must be remembered that when the lamps become old and more or less dirty between cleaning periods the emitted light falls off about 25 per cent. Consequently for a desired foot-candle illumination the rating of the lamps must be about 33 per cent higher than that found necessary from calculations based on the efficiency of new clean lamps.

Central Station Service

A Department Devoted to Commercial Policy and Management Topics, Including Methods of Increasing the Use of Electric Light, Power and Heat

Northwest Utility Sells $1,000,000 Issue Locally in Eleven Days

IN ELEVEN working days in September the Puget Sound Power & Light Company, Seattle, Wash., disposed of an issue of $1,000,000 in five-year 8 per cent gold coupon notes. This is said to be a record in security selling in the Northwest, as twenty days had been assigned to the sale. The notes were in denominations of $100, $500 and $1,000. An executive of the company, in commenting on the sale, says:

"An interesting example of the tendency toward cooperative ownership of large corporations is shown in the subscription list. The entire issue was oversold in less than eleven working days. Through the efforts of the organization itself, and without any underwriting by bond houses, it was distributed over all the territory served by the company.

"More than a thousand employees of the company (more than half the total number of persons employed) became interested in the company's securities in this short time, and purchases by employees alone absorbed more than 40 per cent of the total issue. Participation by customers and employees in ownership of the property is bound to benefit all concerned by retaining the income from the securities in the Puget Sound district and in broadening the interest and understanding of the company's operations and problems in the 147 communities served."

Cost of Rural Line Construction in Ohio

RURAL lines radiating from Greenville, Ohio, single-phase and carrying 2,300 volts, cost on the average about $750 per mile, exclusive of transformers, meters and overhead expense, when built by the farmers in accordance with the specifications of the Greenville Electric Light & Power Company.

The company requires the farmers to use 25-ft. (7.5-m.) poles set forty-two to the mile, 3-ft. (91-cm.) Washington fir cross-arms, galvanized braces and bolts and No. 6 B. & S. (13.3-sq.mm.) bare copper wire. The detailed costs are given in the accompanying table. These figures vary a little with local conditions, for instance, when 30-ft. or 35-ft. (9-m. or 10.5-m.) poles have to be used to cross telephone wires or highways.

In cases where the farmers do not include the cost of their work in hauling the poles and digging the holes, the cost of the line may be as low as $550 per mile in actual cash expended.

It is said that if the farmers will follow the central station's specifications and instructions no engineering advice will be needed, and the company, therefore, does not charge the farmers any engineering or overhead fee. The utility company inspects the line after it has been completed and does not switch on the service until the line has been built according to its specifications.

One of these 2,300-volt lines extends out for 6 miles (9.6 km.) and has branches totaling about 3 miles (4.8 km.). All customers on the main line and branches are being given satisfactory service. A 6,600-volt line built to extend out about 12 miles (19 km.) cost about $1,000 a mile, including a 50-kva., 2,300-volt to 6,600-volt, 60-cycle step-up transformer.

Rural customers in this section of Ohio average only about five per mile, though the line construction is of ample capacity for ten to twelve customers per mile, consequently there has been no trouble from overloaded lines. None of the farmers in the district use motors or devices which call for a transformer capacity in excess of 1 kva., the size used for each individual customer on all 2,300-volt lines. For customers on 6,600-volt lines 1.5-kva. transformers are used. However, with this size it is sometimes possible to serve two farmers from the one transformer. The customers must purchase the transformers from the central station, and if desired, the central station company will install the transformers at the customers' expense. Each customer's service meter is furnished and installed by the utility and at its expense.

COST PER TYPICAL MILE OF 2,300-VOLT RURAL LINE

Forty-two poles, at $4.50 each	$189.00
850 lb. bare copper wire, at 25 cents per lb	212.50
Forty-two 3-ft. cross-arms, at 65 cents	27.30
Eighty-four insulators, at 7 cents each	5.88
Hardware, at 50 cents per pole	21.00
Eighty-four pins at 5 cents each	4.20
Labor erecting, digging and hauling	290.12
Total	$750.00

The absence of any appreciable power load makes the energy consumption of these rural customers small, and the average for 300 farmers in the district is only 15 kw.-hr. per month. The rates for service consist of a fixed charge of $1 per kilovolt-ampere of transformer capacity per month plus an energy charge of 10 cents per kilowatt-hour. No discount is allowed for prompt payment.

The high cost of reading meters for these rural customers has made it necessary to have the meter reader make out and deliver the bill at the time the meter is read. A man in a Ford car can cover about 35 miles (10.5 m.) and read 125 meters in one day. The meter reading in this case also includes making out and leaving the bills on the customers' premises. The total cost of reading and billing under this plan is 7 cents per customer exclusive of overhead charges, against only 2 cents per customer in the cities.

This information was given by D. L. Gaskill, president of the Greenville Electric Light & Power Company, in the course of a discussion on farm-lighting business before the last convention of the Ohio Electric Light Association at Cedar Point, Ohio.

Employees Instructed in All Operations of Company

BELIEVING that members of the various department forces could do better work if they knew more of the problems and work of other departments, the Oklahoma Gas & Electric Company has undertaken a series of studies known as "information courses." The first course has been finished and the second is about half completed.

Lectures are given by department heads at 1 p.m. each Tuesday and Friday. Where practical demonstrations are made forty minutes of the period is devoted to the lecture and twenty minutes to the practical demonstrations. It was found that more than two-thirds of the office employees had never seen the power house, meter-department shop and other parts of the property. Clerks handling work orders, material sheets, etc., did not know the physical appearance of the items with which their work was concerned and therefore could not judge whether cost figures were reasonable or not. The course is laid out with a view to familiarizing employees with all the operations of the company and thus increasing efficiency and interest. Attendance is entirely optional and classes are limited to twenty as this number has been found most convenient to handle at one time. Employees have manifested keen interest in the courses and at a number of meetings have brought members of their families. Applicants for the second course were double the number that could be accommodated in one class.

Salvaging Municipal Plants When Utility Takes Over System

AN INTERESTING solution of some municipal-plant problems involving the discarding of obsolete systems and starting afresh has been worked out in the territory of the Wisconsin-Minnesota Light & Power Company. Originally several plants and distribution systems were purchased, but interest charges, cost of reconstruction or heavy maintenance charges on the old systems imposed a handicap on the company in giving service at reasonable cost.

As most of the plants involved were either direct-current or obsolete alternating-current systems, it was decided to proceed on the basis of abandonment of systems that were badly depreciated, the municipality to sell the salvaged equipment to the best advantage. In several instances proper presentation of the situation at special elections has resulted in a vote as high as 90 per cent to scrap the obsolete system, give the company a franchise and permit it to construct a new distribution system. In most communities the municipal plants were able to supply night service only, while the Wisconsin-Minnesota company could give twenty-four-hour service from its transmission system. Such a plan must, of course, be carefully worked out before an attempt is made to apply it. When a municipality is asked to scrap its old plant, the reasons that lie back of the request must be sound and the community must be shown that such a course is a real economy.

Since utility financing in the usual manner has been practically impossible, it was decided to ask these communities to appoint a committee on electric light subscriptions to raise sufficient money for the new construction, including connection to the transmission system.

This money was advanced to the company on its 7 per cent promissory notes at par. One-year or where possible five-year notes, payable one-fifth each year, have been issued, the approval of the Wisconsin Railroad Commission for the issuance of such notes having been secured.

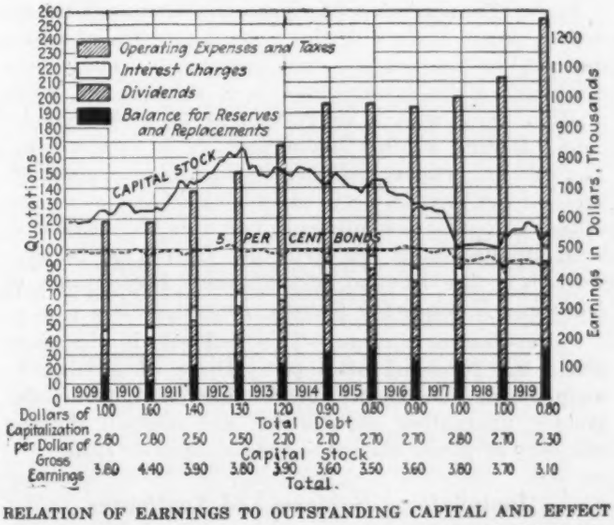
The financial plan, while a temporary one, gives the community a direct interest in the property and opens the way to the sale of other company securities. To the 5 per cent first and refunding bonds of the company an additional coupon has been attached in the form of a promissory note, paying 3 per cent additional and payable at the same time as the bond interest coupon, making the purchase of such bonds an 8 per cent investment.

It is expected that the temporary 7 per cent notes will be the means of interesting customers in either these bonds or company preferred stock. These securities are sold at par. The whole plan results in securing par value for securities, which is a decided advantage.

P. D. KLINE,
Vice-President and General Manager.
Wisconsin-Minnesota Light & Power Company,
Eau Claire, Wis.

Utility Chart Shows Many Facts in Small Space

THE importance of avoiding undue complication in plotting statistical data was emphasized at the Kineo (Me.) convention of the New England Geographic Division, N. E. L. A., in an address by W. H. Blood, Jr., of Stone & Webster, Boston. An example was given by the speaker of a chart which has been used by the securities department of Stone & Webster for a number of years to give bankers and investors the information which they wish in regard to the companies concerned.



RELATION OF EARNINGS TO OUTSTANDING CAPITAL AND EFFECT ON SECURITY VALUES AS REFLECTED IN MARKET QUOTATIONS

Such a chart for the Tampa (Fla.) Electric Company is reproduced herewith. While many facts are shown in this single diagram, they are so presented that one can readily study a single item at a time, and the mind is not confused by extraneous matters.

Digest of Electrical Literature

Including Brief Abstracts of and References to Important Articles Appearing in the Scientific and Engineering Press of the World

Generation, Transmission and Distribution

Surface Leakage as a Factor in Insulator Design.—T. M. FEDER.—The various factors influencing surface resistance and methods of increasing it are discussed. It is shown that the most economical way of decreasing the leakage is the addition of properly proportioned corrugations on the underside of the flange or skirt. Typical computations are given, showing the approximate increase to be expected when corrugations are added.—*Journal A. I. E. E.*, September, 1920.

Method for Computing the Dimensions of Wooden Transmission-Line Poles.—P. NEUMANN.—The author criticises present German standards for designing wooden poles and presents a graphical method permitting a rapid determination of the necessary dimensions for given load of ordinary line poles as well as of corner poles and of anchoring poles made of single or double-log. A more extensive use of double-log poles is recommended, a double-log pole being good for five times the top pull permissible with a single-log pole of the same diameter and height.—*Elektrotechnische Zeitschrift*, May 27, 1920.

Power Alcohol.—ERIC SINKINSON.—It is said that during the war it was found that benzole could be distilled from gas, and it is obvious that alcohol could be produced within the British Empire. The author states that it is possible to mix benzole and alcohol in equal proportions and thus make an admittable fuel for consumption in the internal combustion engine at present in use.—*Beama*, August, 1920.

Power Transmission Equipment.—WILLIAM CROOKS.—This paper deals with the general problem of transmission-line construction and equipment. There is a discussion of the standardization of voltages for transmission lines, with a suggestion as to the maximum values toward which current practice is approaching. The relation between distance of transmission and voltage and the relation between spacing of the wires and voltage are also considered. There is in addition a brief discussion of the principal factors to be considered in the location of the line.—*Proceedings of Louisiana Engineering Society*, August, 1920.

Power-Station Design.—This subject is discussed under the following divisions: Drive of auxiliaries, maintenance of efficiency, condensing plant, feed-water system, guarantees and testing, and over-all thermal efficiency of power station.—*Beama*, August, 1920.

Installations, Systems and Appliances

Self-Exciting Mercury-Arc Rectifier.—A difficulty with ordinary mercury-arc rectifiers is their tendency to go out if the load drops below a certain point. The A. E. G. therefore has put on the market a kind of "self-exciting" rectifier, which will keep going even if the load is completely shut off. The new rectifier type is of glass, quite similar to current models, but is provided with two auxiliary anodes fed from a special winding on the input compensator. This winding has a mid-point tap which is connected to the cathode, and in the auxiliary-anode connections are inserted two resistors, so that the auxiliary system forms, as it were, a small rectifier within the power rectifier. This auxiliary rectifier system takes about 100 watts, is started in the ordinary way and is always kept running. It will then automatically excite the power arcs so that the main rectifier starts as soon as the direct-current output circuit is closed, and the rectified current thus is perfectly stable down to very small current strength.—*Elektrotechnische Zeitschrift*, June 3, 1920.

Feed Heating for Land Power Stations.—K. BAUMANN.—It is said that while the economizer improves the efficiency of the boiler plant, in practice its adaptation is considerably limited owing to the danger of sweating of the tubes and consequent corrosion when the temperature of the water entering the economizer is below the dew point of the flue gases leaving the economizer. For this reason the temperature of the feed water entering the economizer should not be less than 90 deg. to 110 deg. Fahr. (32 deg. to 43 deg. C.), depending upon the amount of moisture contained in the gases of combustion. In order to raise the feed water to this temperature very different methods of heating the feed water are discussed. The various methods of feed-water heating are considered with a view to getting at the best over-all plant efficiency.—London *Engineer*, July 30 and Aug. 6, 1920.

Electrophysics and Magnetism

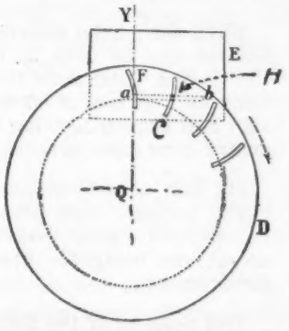
Electrical Discharges from Pointed Conductors.—JOHN ZELENY.—The discharge between pointed conductors is investigated with reference to any possible surface action, to the use of coated points for recording, which may be of various salts; to the influence of the curvature of the surface, and to the material of which the points are made.—*Physical Review*, August, 1920.

Artificial Sensibility of Rectifying Galena Contacts.—FLORISSON.—The writer has found that crystals of galena, whether originally rectifying or not, almost always obtain a high rectifying power if heated in a current of nitrogen containing vaporized sulphur. The rectification is of the same sign (direction from crystal to point) as in naturally sensitive samples, while non-sensitive samples before the treatment usually have a feeble rectifying effect in the opposite direction. During the process of making them sensitive there is formed on the surface of the crystal a thin layer of some sulphurous material of about 1/20,000 mm. thickness. The author assumes that naturally sensitive crystals also have such an active layer, formed under the influence of sulphur, deposited at the same time as the galena crystals.—*Comptes Rendus*, July 12, 1920.

Units, Measurements and Instruments

On the Use of Thermocouples of Iron and Nickel Alloys, at High Temperatures.—HOFFMANN and SCHULTZE.—A comprehensive study made at the German Reichsanstalt to find out what service couples without platinum and other expensive metals will give when used for high-temperature measurements. The article contains a great deal of tabular material from which may be gathered that several of the tested couples would give readings accurate within 10 deg. C. even after a 100-hour heat run at 1,000 deg. or 1,200 deg. C. Thermocouples of nickel-chrome alloys and of a 66 per cent nickel steel were particularly resistive against abuse, as were also those with a carbon tube for one electrode. In the carbon-tube type the other electrode was a nickel wire, carried inside the carbon tube in an insulating tube of porcelain, and the connection was made by a screw clamp. On a curve sheet is shown the thermo-electromotive force from 0 deg. to 1,200 deg. C. with respect to the platinum of the carbon tube and the ten metal samples used for constructing the investigated couples. On another curve sheet is shown the temperature variation of the thermo-electric constant for the couples made up of platinum and the various samples.—*Elektrotechnische Zeitschrift*, June 3, 1920.

Instrument for Photographical or Electrical Registration of Periodic Changes in Rotational Velocity.—BLONDEL.—A disk *D* with small curved windows is fastened on the shaft of the machine whose hunting is to be investigated. Behind the disk is a screen *E*, with a slot *ab*, and a ray of light is caused to fall on the disk, through the hole formed at *H*, and on a film or sensitive



SLOTTED DISK FOR OPTICAL REGISTRATION OF HUNTING

paper suspended on a drum behind the screen. The illumination of the slot is intermittent, caused by periodic sparks, or else by means of an arc and a shutter which rotates at a constant speed. Now, if everything moves in synchronism, there will come a flash of light every time the disk *D* passes through the position in the figure, and a beam of light will each time fall on the film. If there is the same number of flashes of light per revolution of *D* as there are little windows along the circumference, there will result just as many spots on the sensitive film, and all these spots will lie in a straight line on the film. However, if the shaft carrying the disk *D* does *not* revolve quite uniformly, the flash of light will come when the disk is in a slightly different position from that shown in the figure, and the spot will appear displaced on the film. If the shaft *Q* is carrying out a regular hunting motion, there will be on the film a wavy line of spots, indicating the deviations from uniform rotation. Screen *E* may be omitted if cylindrical lenses are substituted.—*Comptes Rendus*, Aug. 9, 1920.

Telegraphy, Telephony and Signals

Page-Printing Telegraph Receiver, System Morkrum.—This apparatus is an American invention and is used in this country for receiving telegraph messages on multiplex, the message being directly printed in ordinary type, on a telegram form, instead of on long ribbons. The article gives a detailed description of the mechanism of the Morkrum printer.—*Archives des Postes*, June, 1920.

Note on the Input Impedance of Vacuum Tubes at Radio Frequency.—JULIUS WEINBERGER.—It is shown experimentally that the input impedance of a three-element vacuum tube at radio frequency is not infinite, as heretofore supposed, but that because of the capacitive coupling between input and output circuits within the tube itself the input impedance greatly depends on the character of the output circuit. Experiments with resistance in the output circuit are given and a theory is advanced to explain the results observed.—*Proceedings of the Institute of Radio Engineers*, August, 1920.

Miscellaneous

Method for Locating Buried Conductors.—DIECKMANN.—A long-buried conductor, for instance a cable or a pipe line, will tend to direct and concentrate electromagnetic waves traveling over the ground where the conductor lies buried. This is utilized for determining the location of such conductors in a method patented by the Gesellschaft für drahtlose Telegraphic. A big coil antenna excited from an ordinary spark station on a motor car serves as a transmitter, and a similar coil antenna is used for receiving. The two antenna frames are carried along the ground, and the man receiving the message has to direct the carriers till a maximum of sound is heard in his headphones. A wave length of 1,500 m. is employed, and using a 200-watt transmitter, the antenna frames must be kept 40 ft. or 50 ft. (12 m. or 15 m.) apart to avoid direct induction. Even a thin lead-covered single-pair telephone cable 5 ft. or 6 ft. (1.5 m. or 1.8 m.) deep could be located within a few feet by means of this outfit.—*Elektrotechnische Zeitschrift*, June 3, 1920.

Greatly Increased Use of Electricity in the Production of Various Metals.—Disregarding electrochemical processes, electricity is used in the metallurgy of the following metals, either as a heating agent or for its electrolytic effect: Pig iron, steel, cast iron, the ferro-alloys, aluminum, copper, brass, lead, zinc, gold and silver. The power used in these processes in the United States and Canada is estimated as approximately 1,300,000 kva., not including motor load. The following table gives information regarding electric furnaces for smelting of iron ore:

Country	Type of Furnaces	Number of Furnaces	Size of Units, Kva.	Transformer Capacity
Sweden	Shaft	19	2,000 to 7,000	64,000
Norway	Pit	3	1,200	3,600
Norway	Shaft	1	3,000	3,000
Switzerland	Shaft	2	3,000	6,000
Japan	Shaft	2	3,000	6,000
Italy	Shaft	6	3,000	18,000

It should be noted that the shaft furnace appears to be especially adapted for the production of low carbon and silicon iron, and not foundry iron. It operates best with charcoal as a reducing agent.—Toronto *Electrical News*, Sept. 1, 1920.

A DECISION declaring discriminatory all existing special power contracts of the Utah Power & Light Company has been rendered by the Utah Public Utilities Commission, which has ordered standard schedules applied to these contracts. The contracts under investigation were with copper-mining companies, and their abrogation will add approximately $1,000,000 to the revenue of the electric company.

JOHN W. LIEB, M. S. Sloan, Frank Hedley and five other men prominent in utility management have been appointed by Public Service Commissioner Lewis Nixon of New York to form a committee to supervise and police coal distribution to public service companies in that city.

NEBRASKA may give its State Railway Commission full power to regulate all public utilities as the result of the adoption of a constitutional amendment by the voters.

BOND and note issues of electric light and power companies for the past week totaled $9,000,000, three companies being represented. Interest under 8 per cent is borne by two of these issues.

THE ENTIRE Board of Public Utility Commissioners of New Jersey has been dismissed by Governor Edwards, who alleges undue favor to the bodies under its control. The State Senate has refused to confirm the new appointees, and the courts will probably have to pass on the legality of the Governor's action, the old board meanwhile continuing to exist.

AN ESTIMATE made by the Geological Survey of bituminous-coal reserves as of March 1 and June 1 of this year places the amount in storage by electrical utilities as three weeks' supply on the former date and three weeks and one day's supply on the latter. This was only about 44 per cent of the supply eleven months previous to March 1.

EXORBITANT rates charged for demand loans by New York City banks are declared by the Controller of the Currency to play a large part in the high price of new capital. As much as 30 per cent, he asserts, has been paid for such loans.

OREGON is considering the establishment of an industrial court along the lines of the one now functioning in Kansas.

THE ST. LAWRENCE waterway plan has received the indorsement of the Hydro-Electric Power Commission of Ontario.

LITTLE change is reported in the market, though prices are stiffening in a measure in New England and along the Atlantic seaboard. Elsewhere there is a slight tendency in the opposite direction. Transportation is generally improving and stocks are commonly large, though a shortage in rigid conduit still obtains. Collections are reported no better, except in the Chicago district. Retailers are holding back Christmas orders. Building is at what is perhaps its lowest ebb.

News in Brief

Summary of Market Conditions and of Recent and Approaching Happenings of Importance to the Industry

WIRE prices are following raw material down. The demand for copper wire, both bare and insulated, is at a low level and cancellations, especially from automobile manufacturers, have been received.

CUBA affords an important field for the sale of electric fixtures, according to a recent report of foreign trade promoters. Use of electricity on the island is asserted to be increasing fast.

THE FIRST flat-rate increase in the history of the Worcester (Mass.) Electric Light Company has been announced, its commercial lighting rates rising from 7½ cents to 9 cents per kilowatt-hour, owing to the cost of coal, which has lately increased to $15 per ton. Power rates are unaffected.

MANUFACTURING interests in New England will seek early legislation establishing fuel commissions in their several states.

SEGREGATION of the scenic areas of national parks to prevent their exploitation while permitting the development of non-scenic areas is to be urged before the next session of Congress.

AN ACCOUNTING system for the Federal Power Commission is to be worked out by the Corps of Engineers, and a chief accountant will be chosen in the near future.

THE QUESTION of private development versus state ownership and operation of the water powers of New York has become an issue in the pending election, Governor Smith favoring the latter policy.

MANY technical societies were to take action this week or will take action in the near future on the question of joining the Federated American Engineering Societies.

CO-OPERATIVE electrical campaigns have been launched at Winnipeg and Montreal to cover the Canadian provinces of Manitoba and Quebec respectively.

STATION-OPERATING men of the Ohio Electric Light Association met at Dayton to consider the need for investigation of boiler refractories.

POSSESSION of certificates of inspection by the policy holders is to be insisted on more strictly by fire insurance companies in cases of fire supposed to have been caused by electrical defects.

SHORT-TERM notes backed by long-term bonds were advised for the current financing of public utilities in the address made by Harry E. Mendes before the American Electric Railway Association at its Atlantic City convention.

WITH the partial replenishment of the streams by rain in California, the Power Administration restrictions on the use of electricity for sign and display lighting and in industry have been rescinded.

SIX NEW advertisements of water-power projects have been made by the Federal Power Commission, all except one being for Pacific Coast developments.

THE FAILURE of the Swiss Electro Bank as a result of the foreign exchange situation is announced.

STATE utility commissioners will meet in Washington on Nov. 9-12, when round-table discussions on various phases of commission work will take place.

SUIT against the Simplex and Westinghouse companies by the Majestic Electric Development Company for infringement of heater patents has been won by the defendants in the United States District Court in Idaho. The plaintiff company will appeal the case.

EXPORTS of electrical materials for the first eight months of 1920 were $61,022,347, comparing with $62,294,672 in 1919. A great jump in exports of rheostats in August is reported.

News of the Industry

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields With Announcements and Reports of Association Meetings and Conventions

Special Power Rates in Utah Held Discriminatory

THE Public Utilities Commission of Utah has just rendered a decision, effective Oct. 22, whereby all existing special power contracts of the Utah Power & Light Company with customers in Utah are declared discriminatory and this business is ordered placed on standard schedules. This finding is the result of the hearing which has been going on for some time before the commission in a special contract case. The order means an additional revenue to the power company of approximately $1,000,000 annually. The special customers will probably appeal to the State Supreme Court.

These special contracts date back many years to a time before the present company was organized. They were made at an extremely low rate with copper-mining interests which were represented on the controlling board of the power supply company.

To Urge Laws Preventing Exploitation of Scenic Areas of National Parks

SEGREGATION of the scenic areas within the national parks almost certainly will be asked of the next session of Congress. The boundaries of most of the national parks include vast areas of non-scenic lands. It is believed that power and irrigation development can best be carried on if there is an absolute separation of the scenic from the non-scenic land. Under such conditions legislation prohibiting any class of exploitation of the scenic areas would be final. On the other hand, as long as the present boundaries exist there will be a constant effort to secure legal authority to permit of certain types of exploitation.

The matter is of special importance at this time when a number of new park areas are under consideration. It is believed that the public is in sympathy with an absolute prohibition of exploitation on areas of outstanding scenic value, but it is equally probable that the public does not want to see commercial developments halted on non-scenic lands.

Fight on State or Private Control of Water Powers in New York

WHETHER the state or private interests shall own and develop the water-power resources of New York is becoming one of the dominating issues of this year's gubernatorial contest in the Empire State. Governor Smith is running for re-election on a state development-ownership-control-platform, while Judge Miller, the Republican nominee, takes the position that greater benefits will accrue to the people of the state through private development and operation.

Governor Smith very clearly stated his position on water-power development this week as follows: "I am for state development, state ownership and state control because I am sure that is the only way in which the people will themselves get any benefit from this God-given resource, because under private development the price of electricity is exactly the same in Buffalo, where it is developed from the Falls, as it is in the city of New York, where every bit of it is developed from coal which is dragged all the way from Pennsylvania."

Lower Yields on New Utility Financing

BOND and note issues of electric light and power companies for the past week total $9,000,000, with three companies represented. Of this total, $2,500,000 is in fifteen-year, 8 per cent secured gold notes of the Middle West Utilities Company offered at 96 to yield the investor 8.5 per cent.

Of the two bond issues, one is $5,000,000 in 7½ per cent sinking fund gold bonds of the Wisconsin Electric Power Company. These bonds, which are offered at 99 and mature Oct. 15, 1945, yield but slightly more than 7.5—a return that is below the average for this class of securities in the last six months. The remaining $1,500,000 is in thirty-year, first mortgage 7 per cent gold bonds of the Kentucky & West Virginia Power Company, Inc., sold at 91½ and yielding 7¾.

Co-operative Campaigns Launched at Winnipeg and Montreal

CO-OPERATIVE campaigns for the intensive development of the local electrical markets in the Canadian provinces of Manitoba and Quebec have been launched as the result of great meetings of all branches of the electrical industry held at Winnipeg Oct. 13 and 14 and at Montreal Oct. 19 and 20.

Nearly four hundred electrical men attended the Winnipeg banquet at the Royal Alexandria Hotel Oct. 14, when W. L. Goodwin, M. C. Turpin and others outlined a plan for co-operation in Manitoba. The guests of honor at this dinner included many Manitoba notables, among them the Premier, the Mayor of Winnipeg, J. G. Glassco, manager of the city lighting plant; J. M. Leamy, power commissioner, and others. As the result of several enthusiastic meetings a co-operative campaign was undertaken by the local Electrical Development League, with J. E. Gilmour, Northern Electric Company, as chairman, and J. G. Smith, Great West Electric Company, as secretary-treasurer.

More than five hundred electrical men of Montreal and the Province of Quebec attended the series of meetings culminating in that of the Montreal Electrical League Oct. 20, when plans were outlined by a local committee of the industry for the institution of an electrical co-operative campaign in Montreal and the Province of Quebec. W. L. Goodwin, S. A. Chase and others told of the results of the electrical co-operative campaign in California and the organization of similar

campaigns in Oregon, Washington and British Columbia. After adopting a plan of organization the Electrical Co-operative Association of the Province of Quebec was formally organized to begin work with officers as follows:

Honorary president, J. S. Norris, vice-president Montreal Light, Heat & Power Consolidated; president, K. B. Thornton, general manager Montreal Public Service Corporation; vice-presidents, J. B. Woodyatt, general manager Southern Canada Power Company; J. W. Pilcher, Canadian General Electric Company; M. K. Pike, general sales manager Northern Electric Company; F. J. Parsons, manager McDonald & Willson; N. Simoneau, Simoneau Electric Contracting Company; Dr. L. A. Herdt, McGill University.

An advisory committee was elected with these members:

Power company representatives: W. O'Brien, chairman, Montreal Light, Heat & Power Consolidated; L. C. Haskell, secretary-treasurer pro tem., Southern Canada Power Company; R. J. Beaumont, Shawinigan Water & Power Company; N. L. Engel, Montreal Public Service Corporation; W. J. Lynch, Quebec Railway, Light & Power Company.

Manufacturers' representatives: C. Duncan, manager Duncan Electrical Company; George Wight, Monarch Electric Company; C. F. Nedbury, general manager Canadian Westinghouse Company.

Jobbers' representatives: J. W. Pilcher, general manager Canadian General Electric Company; M. K. Pike, general sales manager Northern Electric Company; S. W. Smith, president Electrical Equipment Company.

Contractor-dealers' representatives: J. A. St. Amour, Montreal; F. Parsons, McDonald & Wilson, Montreal; A. Doddrige, manager Quebec Electric Company, Quebec; J. Nault, Nault & Brown, Three Rivers; W. Wiggett, Electric Repair & Contracting Company, Sherbrooke.

Consulting engineers: J. M. Robertson, J. M. Robertson & Company; DeGaspe Beaubien.

Bell Telephone Company representative: W. H. Winter, general superintendent of plant Bell Telephone Company of Canada.

Ohio Operating Men See Need for Investigation of Refractories

ABOUT forty Ohio central-station operating men met at Dayton on Wednesday of this week under the auspices of the station-operating committee of the Ohio Electric Light Association. C. D. Zimmerman of the Cleveland Electric Illuminating Company reviewed the results obtained with powdered coal in central power stations and outlined the conditions under which pulverized fuel firing and stoker firing may each be used to the best advantage.

A round-table discussion on boiler furnace linings seemed to indicate the need of an investigation to determine the conditions for which different available refractories are best suited. George A. Orrock of New York read a paper on the development of power-plant efficiency.

Short-Term Notes Backed by Long-Term Bonds Advised for Financing

WITHOUT necessarily desiring to lay down a fixed rule under the present abnormal conditions, it is probably the best policy for public utilities to issue short-term notes at market rates, secured by long-term treasury bonds at normal rates deposited as collateral for the short-term notes. This was the assertion made by Harry E. Mendes of Touch, Niven & Company, New York, last week before the annual convention of the American Electric Railway Association. The underlying assumption, of course, the speaker said, is that upon maturity of the short-term notes conditions in the financial world will have adjusted themselves to a more normal basis and that it will then be possible to issue the long-term bonds in substitution for the notes.

California Contractors Continue "More Outlets" Campaign

REALIZING the benefits of the installation of sufficient convenience outlets, the California State Association of Electrical Contractors and Dealers has appointed a committee to assist further in the work that the California Co-operative Campaign has done along this line. Invitations have been given the American Institute of Electrical Engineers, Illuminating Engineering Society and the American Society of Mechanical Engineers to appoint unifying committees.

New Jersey Governor Having Trouble Ousting Utilities Commission

THE Board of Public Utility Commissioners of New Jersey has been dismissed by Governor Edwards on the ground that the commission had been too favorable to the utilities. A new commission has been appointed by the Governor, but the State Senate has refused to confirm the appointments, so that for the present the old board will continue in existence.

In taking this action the New Jersey Senate adopted a resolution to the effect that as there was grave legal doubt as to the power of the Governor to oust the commission and to appoint a new body, nominations of all prospective members be referred to the Senate judiciary committee and the Attorney-General be directed to take steps to institute legal proceedings to determine the legality of the Governor's action.

The names of the nominees for the new board as submitted are: Representative J. A. Hamill; Arthur A. Quinn, president of the New Jersey State Federation of Labor; Walter F. Whittemore, State Highway Commissioner and a civil engineer; Treadwell Cleveland, member of editorial staff of Newark *Evening News* and before that assistant in the Forestry Service; ex-Senator James A. C. Johnson.

State Utility Commissioners to Discuss Public Relations

A VARIATION in the program of the convention of the National Association of Railway and Utilities Commissioners will be made this year in that considerable time will be devoted to round-table conferences on topics not covered by the standing committees. Four topics have been selected for discussion, including "Enforcement of Service Standards" and "Public Relations."

The thirty-second annual convention of the association will be held in Washington, D. C., Nov. 9-12, in the main hearing room of the Interstate Commerce Commission, in the commission building.

Reports of the following standing committees will be of particular interest to the public utilities: Safety of operation of public utility companies, service of public utility companies, public utility rates, statistics and accounts of public utility companies (at which time the uniform classification of accounts will be presented for final action), valuation committee, capitalization and intercorporate relations, state and federal legislation.

Fuel Distribution Committee Appointed for New York

TO SUPERVISE and police the coal situation of the public utility companies in New York City a committee to be known as the New York Fuel Distribution Committee has been appointed. The members of the committee are J. W. Lieb, vice-president of the New York Edison Company, chairman, with Frank Hedley, president of the Interborough Rapid Transit Company; M. S. Sloan, president of the Brooklyn Edison Company; Walter R. Addicks, of the Consolidated Gas Company; C. Andrade, Jr., of the Wholesale Coal Trade Association; W. J. Welsh, of the New York & Richmond Gas Company; R. H. Nexsen, electrical engineer of the Public Service Commission, and C. W. Wilder, of the New York Edison Company, secretary.

Government Estimate of Coal Reserves of Electric Public Utilities

AN ELABORATE report on consumers' stocks of bituminous coal as of March 1 and June 1, 1920, prepared by the Geological Survey in co-operation with the United States Bituminous Coal Commission and the Council of National Defense, has the following statements under the heading of "Electric Public Utilities":

Electric public utility plants consume between 5 and 6 per cent of the country's output of fuel. In 1917 they required 31,693,000 net tons of soft coal. Two years later their combined consumption of bituminous and steam sizes of anthracite was 35,000,000 tons. The reserves at electric utility plants are therefore an important item in the total quantity of coal in storage. The average reserve on July 15, 1918, was sufficient for five weeks and four days' operation. From Nov. 11, 1918, to Jan. 1, 1919, stocks averaged about seven weeks' supply. During the first quarter of 1919 the average decreased from seven weeks to six weeks and six days. On March 1, 1920, the average had dropped to three weeks' supply, or only 44 per cent of what it had been eleven months before. The percentage of decrease during those eleven months was greater for the electric utilities than for any other general class of consumers except the steel plants and the railroads. One reason for this condition appears to be that the very large group of electric plants in the industrial Northeast was especially affected by the coal strike of November-December, 1919.

During the period from March 1 to June 1, 1920, stocks at electric plants increased slightly, amounting on June 1 to three weeks and one day's supply.

Broad Program Laid Out for Southeastern N. E. L. A. Convention

THE annual convention of the Southeastern Geographic Section, National Electric Light Association, will be held at Miami, Fla., on Nov. 16, 17, 18 and 19, with the Urmey Hotel as headquarters. From the outlook at the present time this convention promises to be one of the most successful meetings that the section has ever held. Papers expected are: "Regulation of Public Utilities," by A. J. Maxwell of the North Carolina Public Service Commission; "Public Policy," by Z. V. Taylor, president Southern Public Utilities, Charlotte, N. C.; "Safety Work," by W. R. Lloyd, manager casualty department Alabama Power Company, Birmingham; "Steam-Plant Operation," by C. A. Greenidge, chief engineer J. G. White Management Corporation; "Design and Construction of 2,300-Volt Distribution Lines," by T. H. Rice, engineering department Henry L. Doherty Company; "Labor and Employment Methods," by J. T. Trazzare, manager employment and public relations department Georgia Railway & Power Company, Atlanta; "Accounting," by F. B. Culley, assistant treasurer Augusta-Aiken Railway & Electric Corporation; "Association Activities," by M. H. Aylesworth, executive manager National Electric Light Association; "Automatic Generating Stations and Substations," by T. F. Barton, engineer General Electric Company, Schenectady, N. Y.; "Electrical Merchandising," by S. A. Chase and W. L. Goodwin.

The social side of the program has not been neglected. The first night's entertainment has been turned over to the manufacturers and jobbers. The evening of the eighteenth there will be a trip to Bimini Island, returning to Miami on the next afternoon.

The Florida Ice and Public Utilities Association will meet at Miami on Nov. 15 and 16.

Rain Comes and Restrictions Go in California

RECENT rains in California have replenished the streams to a limited degree and have released the electric power that was being used for irrigation pumping. As a result Power Administrator Butler last week issued an order eliminating restrictions on the use of electricity for sign and display lighting, and prohibited lamps in stores, theaters and streets came into use again. The restrictions on the industrial use of electricity have also been removed. Steam plants must still be operated to their full capacity.

Many Societies to Take Action on Federation Soon

IN ADDITION to the thirteen societies that have already become charter members of the Federated American Engineering Societies, seven societies to which an invitation to become charter members has been extended were to have considered the question this week and ten others at later dates, as indicated below:

American Institute of Architects.—Favorable report of committee will be considered by board of directors at November meeting.
American Society of Civil Engineers.—Ballot in progress to be canvassed Nov. 8.
Albany Society of Civil Engineers.—Oct. 26.
Associated Engineering Societies of St. Louis.—Oct. 20.
Brooklyn Engineers' Club.—Nov. 11.
Engineers and Architects' Club of Louisville.—Oct. 19.
Engineers' Club of Cincinnati.—Oct. 21.
Engineers' Club of Columbus.—Oct. 29.
Engineers' Club of Philadelphia.—Nov. 13.
Engineers' Club of St. Louis.—Oct. 20.
Engineering Society of Wisconsin.—Feb 11-12.
Engineering Society of Western Pennsylvania.—Nov. 4.
Grand Rapids Engineering Society.—Oct. 25.
Iowa Engineering Society.—Oct. 20.
Louisiana Engineering Society.—Nov. 8.
Mohawk Valley Engineers' Club.—Nov. 4.
National Fire Protection Association.—Oct. 21.
Washington Society of Engineers.—Oct. 20.

The following societies have referred the matter to a special committee for report at an early date: Associated Engineers of Spokane, Boston Society of Civil Engineers, Colorado Society of Engineers, Illinois Society of Engineers, Illuminating Engineering Society (by its council), Oregon Technical Council, Rochester Engineering Society, Society of Automotive Engineers and Western Society of Engineers.

Commonwealth Edison Company Issuing $5,000,000 of Stock at Par

THE Commonwealth Edison Company is offering a new capital stock issue of a little more than $5,000,000 par value to present stockholders at par. Each stockholder may subscribe for an amount equal to 10 per cent of his present holdings. If stockholders desire, they may surrender their subscription rights, for which the company will pay $2.50 per share of new stock. Such stock will be offered to customers and company employees.

Accounting System Being Worked Out by Federal Power Commission

AN ACCOUNTING system to be used by the Federal Power Commission in its handling of applications and preliminary permits, licenses and valuations, and in its relationship with the states, is to be worked out by the Corps of Engineers. The power commission will choose its chief accountant in the very near future. He will work with the engineer accountants, and as it is probable that an Interstate Commerce Commission accountant will be selected, he will bring to the engineers the experience gained in I. C. C. valuation work. The National Electric Light Association has been asked to co-operate in the preparation of this system of accounting. The commission is very anxious that other organizations contribute such ideas as they may have on this subject. Private interests and individuals generally also are being looked to to supply suggestions in this connection.

Intensive work on the remainder of the regulations to be issued in connection with the water-power act has been begun by the Federal Power Commission. Those portions of the regulations which have not been issued are those which present the greatest difficulties, but as the time is rapidly approaching when they must be used every effort will be made to complete them in satisfactory form at an early date.

The Federal Power Commission has taken possession of its permanent quarters in the Interior Building at Washington.

Electrical Inspectors Discuss Grounding of Secondaries

RULE 15 A of the National Electrical Code, relating to the grounding of secondaries, received the most attention at the meeting in Philadelphia last week of the Electrical Conference and the National Association of Electrical Inspectors. The meeting, which was presided over by Washington Devereux, president of the association, was very largely attended. W. J. Canada, engineer of the National Electric Light Association, who was largely responsible for the writing of Rule 15 A into the code, explained it in great detail. Numerous points relative to this rule and grounding generally were brought up in the question box which was the feature of the meeting.

It was generally admitted that the grounding of secondaries had proved very beneficial, but on the subject of individual service grounds there was considerable debate. Other points that were discussed extensively were multiple grounds, the justification for long grounds to the nearest water source and ground clamps.

A. R. Small and Dana Pierce, both of the Underwriters' Laboratories, told of the history of approved devices and spoke of the inspection work of the laboratories. Dr. M. G. Lloyd of the Bureau of Standards spoke on safety with especial reference to the Safety Code of the bureau and its relation to the National Electrical Code.

Investigating Internal Temperatures of Large Generators

THAT a large number of recently built generators are provided with embedded temperature detectors for the purpose of furnishing actual data upon which to base estimates of hot-spot temperatures in large machines was brought out at a meeting of the standards committee of the American Institute of Electrical Engineers held in New York last week. This will prove particularly useful, it was said, in connection with the effort to show that the American method of rating electrical machinery should be adopted by the International Electrotechnical Commission. It is the present expectation that the next meeting of the advisory committees of the I. E. C. will take place in Paris early in December of this year.

West Virginia Utility Association Again Operative

FOR the first time since the war the West Virginia Public Utility Association became operative on Oct. 5, when the first annual meeting since 1917 was held. During and immediately after the war the association was inoperative, but the meeting on the fifth foreshadowed a resumption of activities on a broad and permanent scale. One of the most important decisions of the conference was that embracing the maintenance of state headquarters permanently in Charleston and the employment of a paid secretary, who is to be appointed later. The gathering of men from over the entire state represented invested capital to the amount of $46,000,000 in public utilities which employ 3,000 men. The morning meeting was almost entirely confined to the discussion of ways and means of co-operating effectively with the Public Service Commission.

The following officers were elected: President, Herbert Markle of Bluefield, of the Appalachian Power Company; first vice-president, C. P. Billings of Wheeling; second vice-president, M. Hetzer of Moundsville; third vice-president, E. W. Alexander of Charleston; treasurer, A. M. Hill of Charleston.

Oregon Industrial Court Is Proposed

SETTLEMENT of all industrial disputes and the regulation of industries by three judges who will constitute a court of industrial relations and who will be appointed by the Governor is the purpose of a bill which will be presented for consideration at the next session of the Oregon Legislature. Although the proposed bill will be copied to some extent from the industrial court law enacted in Kansas, the feature of that measure which provided for the abolishment of the Public Service Commission will probably not be followed. It is likely, however, that the bill, if enacted, will merge the affairs of the present Public Service Commission with the tribunal of industrial relations.

Additional Water-Power Projects Being Advertised

ADDITIONAL water-power projects are being advertised by the Federal Power Commission as follows: Crown Willamette Company, at Oregon City, Ore.; Washington Irrigation & Development Company, Columbia River, Priest Rapids, Washington; Luther Hill project on Sawmill Creek, California; Pit River Power Company, Pit River, California; Davis Power Company, White River between Arkansas and Missouri, and Columbia Valley Power Company, Deschutes River, Oregon.

Nebraska May Have Complete Utility Regulation

THE recently adopted amendment to the Nebraska constitution requiring utilities to report to the State Railway Commission on such matters as may be directed is construed as making it possible for the Legislature to pass a measure enlarging the scope of the present commission to include electric light and power and gas utilities. The wording of the old constitution was ambiguous and there was some doubt whether the Legislature had the right to enlarge the powers of the commission. The amendment clears this up, and it is expected that the Legislature will soon act.

Forty-Million-Dollar Construction Plans of Southern California Company

PLANS for the expenditure of more than $40,000,000 in the extension of its Big Creek and San Joaquin River hydro-electric projects in the High Sierras have been announced by the Southern California Edison Company in its application for a certificate of public convenience and necessity. The items include the construction of a dam to form Florence Lake, a tunnel from that lake to Huntington Lake, a dam to form Shaver Lake, a tunnel and penstocks from that lake to Power House 2-A, of which the capacity is to be 300,000 hp.; a tunnel and penstocks from Power House 2 to Power House 8, which is to have a total capacity of 120,000 hp. Other details of this project were given in the ELECTRICAL WORLD, Sept. 11, 1920, page 513.

Comptroller of Currency Ascribes Dear Money to Wall Street Manipulation

IN CONNECTION with the high rates that public utilities all over the country have to pay for new capital a statement issued last Monday by John Skelton Williams, Comptroller of the Currency, is pertinent. Mr. Williams, while disclaiming any intention to attack Wall Street interests, blames the high money rates in large measure on the exorbitant prices charged for demand loans by New York City banks. The rates for these loans, he asserts, are fixed by a small coterie of Stock Exchange brokers and are subject to frequent change.

At rates varying from 15 to 30 per cent the national banks in New York City lent more than $600,000,000 from Oct. 1, 1919, to Aug. 1, 1920, Mr. Williams charges, while more than 11,000 loans aggregating $1,400,000,000 were made in the same period at rates more than 10 but less than 15 per cent. The total amount of demand loans made by the national and state banks and trust companies of New York City plus the loans placed for their correspondent banks is put at more than a billion dollars.

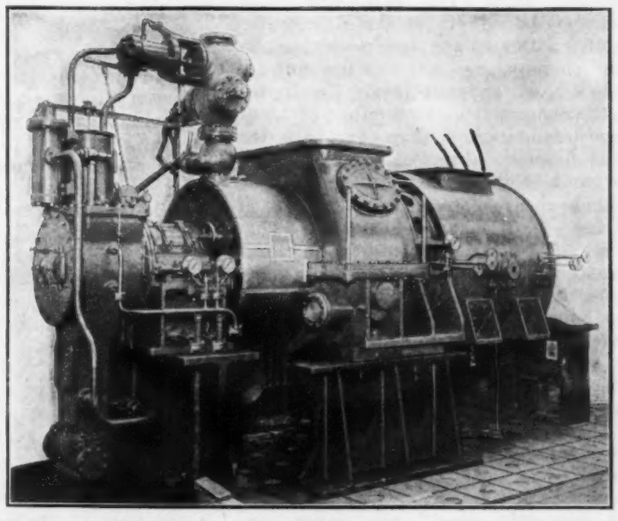
"It is my belief," the Comptroller declares, "that if the call money rates in New York had been maintained at 6 per cent or at the maximum rates which are charged in other money centers, as I believe could have been done with a reasonable degree of co-operation upon the part of the New York banks, the unprecedented shrinkage in security prices in the past twelve months would not have taken place and the apparent loss of billions of dollars in values would have been avoided."

Overhead Receives Attention of Missouri River Jobbers

A WELL-ATTENDED annual convention of the Missouri River Electrical Distributers, held at St. Louis, Oct. 14 and 15, was marked by the general discussion of the jobbers' problem in maintaining profit under increasing expense and of the probable 1921 business. It was agreed that overhead expenses would have to be watched more carefully than ever before.

Interesting papers on current market conditions and the realignment and balancing of stocks through co-operation among jobbers were presented by George Corroa of the Western Electric Company, St. Louis, and F. D. Phillips, Central Telephone & Electric Company, St. Louis, respectively. The question of bonuses to salesmen, based on gross profits and volume of business, and of straight salary without bonus, was also discussed. Kansas City was chosen as the place for the next meeting, probably about the first of next year.

First Electrically Propelled Ocean Freighter Has Trial Trip



THE *Eclipse*, the first general-cargo merchant vessel to be electrically propelled, was given its trial trip on Tuesday, Oct. 19, in and about New York Harbor by the United States Shipping Board. The ship is 440 ft. long and has a deadweight capacity of 11,868 tons. Its propulsion machinery consists of an adjustable speed (20 to 110 per cent) marine turbine-generator set (shown in the accompanying illustration) and a 3,000-hp., three-phase induction motor which drives a single propeller. The electrical equipment was furnished by the General Electric Company and installed by the Vulcan Iron Works.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Large Consumers Voluntarily Pay More Than Scheduled Rates.—An encouraging example of co-operation between a central station and its large power customers is reported from Sandusky, Ohio, where the four largest consumers of electrical energy have voluntarily agreed to pay an increase of 25 per cent over the new rate allowed by the City Commission.

Dutch Engineers Visit Portland Power Plants.—The five engineers from Holland now in this country on a tour of inspection recently visited the various power generating plants and the electric lines of the Oregon Electric and the Southern Pacific companies at Portland, Ore. The party was in charge of J. B. Cox of the General Electric Company of Schenectady, N. Y. The visitors were Barnet Lyon and H. Doyes of The Hague, Leonen Martinet of Utrecht, H. J. Vanlessen of Voorburg and W. J. Burgerdyke of Haarlund.

Puget Sound Company Sells Million-Dollar Note Issue to Local Public.—The Puget Sound Power & Light Company announces that the five-year 8 per cent coupon-note bond issue of $1,000,000 recently offered by the company was oversold in less than eleven working days. The sale was made through the efforts of the corporation itself, without any underwriting by bond houses, in small sizes and in hundreds of subscriptions. Employees of the company to the number of 1,000, constituting more than one-half the total number, absorbed more than 40 per cent of the issue.

Shakespeare's Town in Danger of Losing Its Electrical Supply.—That Mecca of literary tourists in England, Stratford-on-Avon, where for many years the light of the twentieth century has been shed over the relics of the seventeenth, is in danger of reversion to the semi-darkness of the mid-Victorian period. Depreciation of equipment owing to the inadequate rates prescribed by the authorities has brought the electric company to the point where, in the words of a local paper, it "can stand the strain no longer." "If something be not promptly done," the paper continues in a moving strain, "the undertaking will soon be defunct. Our present brilliantly illuminated shops will have to return to their former somberness, the fragile mantle will again come into vogue, artistically decorated rooms will be subjected to discoloration, ceilings darkened with impure emanations, and local machinery made dependent upon spasmodic gas power—when this is available."

Shareholders in Byllesby Utilities Number 40,000.—Figures recently compiled show that the Standard Gas & Electric Company and its utility subsidiaries now have a total of approximately 35,000 preferred and common shareholders, in addition to which about 5,000 individuals have contracted to purchase stock on the partial payment plan. These properties, under Byllesby management, serve 500 cities and towns with 2,200,000 population in sixteen states. Upward of one-half of the total number of shareholders reside in the communities provided with electric and gas service by the organization.

Rate Advances in Many Places.—Increased rates due to higher cost of fuel have been announced by the Municipal Light Board of Concord, Mass. The Vermont Hydro-Electric Corporation of Rutland has also increased its rates for the same reason. Among other places not previously mentioned where increases in some or all schedules have gone into effect recently are Oshkosh, Wis.; Jefferson City, Mo.; Fort Smith, Ark.; San Antonio, Tex.; Boise, Idaho; Binghamton, Jamestown, Clifton Springs and Rouse's Point, N. Y.; Williamstown and Lynn, Mass.; Pawtucket and Woonsocket, R. I.; Rockville and Willimantic, Conn.; Sioux City and New Hampton, Iowa; Rochester, Ind.; Grand Rapids, Mich.; Middle Yuba, Cal., and Nephi, Utah.

Aeroplane Lamps Controlled by Radio.—In connection with obtaining electric power from the Utah Power & Light Company for the operation of the radio station to be established in Salt Lake City, it was stated by Col. John A. Jordan, superintendent of the Western division of the air mail service, that small electric lamps operated by wireless placed on the front of the machines will guide the planes at night on the transcontinental air mail route between Cheyenne, Salt Lake and San Francisco. "The lights will be tuned to the wireless instruments of the three cities in such a manner that they will shine only when the planes are within a certain radio path about 200 ft. in width," said Colonel Jordan. "When a plane strays from this path the lights will go out and the pilot will be obliged to determine by the wind on which side of the route he is traveling. Approach to the destination will be signified by flashing the lights on and off. The process has proved a success in thorough tests and is owned by the government."

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month.

Electrical Supply Jobbers' Association.—The next meeting of this society will be held at the Cleveland Hotel, Cleveland, Ohio, on Nov. 17, 18 and 19.

Pacific Coast Section, N. E. L. A.—Nov. 4, 5 and 6 have been selected as tentative dates for the next meeting of committees of this section, to be held in the Edison Building in Los Angeles.

St. Louis Section, A. I. E. E.—At the September meeting of this section a resolution in favor of the Associated Engineering Societies of St. Louis joining the Federated American Engineering Societies as a local organization was carried unanimously.

Association of Iron and Steel Electrical Engineers.—The Pittsburgh and Birmingham sections of this association meet tonight (Oct. 23). At the meeting of the Pittsburgh Section Arden B. Holcomb will present a paper on "Sheet and Tinplate Mills."

St. Louis Electrical Board of Trade.—James N. Fenton of the St. Louis Fire Prevention Bureau and Fred L. Bock of the Missouri Inspection Bureau addressed the members of the St. Louis Electrical Board of Trade at their weekly luncheon Oct. 5. H. T. Bussman presided.

Syracuse Branch of A. I. E. E. Started.—Edward T. Moore has been made chairman and Frank Simpson secretary and treasurer of the newly organized Syracuse (N. Y.) Section of the A. I. E. E., which will take in the territory from Geneva to Watertown and to Utica, in which there are about eighty-five electrical engineers.

Public Service Company of Northern Illinois Section, N. E. L. A.—Samuel Insull, president of the company, will address the annual meeting of the section at the Morrison Hotel, Chicago, on Oct. 25 and 26, speaking on both days. The officers elected for the ensuing year are: Chairman, F. N. Leonard, Chicago; vice-chairman, W. H. Knutz, Evanston; secretary, M. L. Wright, Chicago; treasurer, E. A. Luney, Evanston.

Coming Meetings of Electrical and Other Technical Societies

Association of Railway Electrical Engineers—Chicago, Oct. 28-30.

Association of Iron and Steel Electrical Engineers—Pittsburgh Section, Oct. 23; Birmingham Section, Oct. 23; Philadelphia Section, Nov. 6; Cleveland Section, Nov. 8.

Institute of Radio Engineers—New York, Nov. 3.

National Association of Railway and Public Utilities Commissioners—Washington, Nov. 9.

Society of Naval Architects and Marine Engineers—New York, Nov. 11-12

American Institute of Electrical Engineers—Chicago Section, Nov. 12.

Electric Power Club—Hot Springs, Va., Nov. 15-18.

National Electric Light Association—Southeastern Geographic Division, Miami, Fla., Nov. 17-19.

Electrical Supply Jobbers Association—Cleveland, Nov. 17-19.

Jovian Order—St. Louis, Nov. 18 and 19.

American Engineering Council—Washington, Nov. 18-20. (For program, see issue of Sept. 25, page 651.)

American Physical Society—Cleveland, Nov. 27: annual meeting Chicago, Dec. 28-30.

American Society of Mechanical Engineers—New York, Dec. 7-10.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities.

Twenty-Cent Rate Disapproved. — A monthly rate of 20 cents per kilowatt-hour for commercial lighting by an electric utility with eighty-five consumers was considered by the Missouri Public Service Commission as likely to result in a decrease in revenue because of curtailed use of energy, and a rate of 15 cents, with minimum and service charges, was therefore substituted.

Long Hours' Use. — Electric rate schedules, the Missouri Public Service Commission holds, should recognize customers who make use of the service a large number of hours, but where business houses do not afford a more favorable load factor than residences the raising of the existing rates in such a way as to favor the former class of customers proportionately is not justified.

Lower Rates for Combined Service Discriminatory.—Schedules which make a lower rate for a combined service for heat and electricity than the aggregate of the rates in effect for such services rendered separately are contrary to the provisions of the California law, according to a decision of the Railroad Commission of that state ordering a contract entered into on this basis by the Pacific Gas & Electric Company canceled. Such agreements are held by the commission to constitute discrimination against other customers.

Powers of New York Commission Over Street-Lighting Contract.—The New York Public Service Commission for the Second District held that it had no jurisdiction in a complaint against the street-lighting rates charged to the village of Horseheads by the Elmira Water, Light & Railroad Company because of the existence of a contract between the company and the municipality, the Public Service Commissions law exempting "state, municipal or federal contracts" from the commission's regulatory powers.

Private Contracts Disapproved.—The New York Public Service Commission for the Second District has refused to approve the continuance of a contract entered into by the Warsaw Gas & Electric Company with its largest consumer at a rate lower than the filed schedule of the company, holding such procedure to be contrary to the statute even where it appears to be good business policy. In determining the true income of an electric utility the amount which would have been produced by the filed rates should be charged against the company rather than the amount actually received by it according to the terms of a private contract.

Theory of Rate Making Subject to Varying Conditions.—The Vermont Public Service Commission has asserted that it has never laid down any rules relative to the basis on which rate making should be placed, whether on original cost, fair return upon prudent investment, sale value, reproduction new less depreciation, or upon any of the other theories which have been considered by the courts and commissions of other states, and considers it doubtful whether any fixed rule applicable to all cases could be formulated owing to the great variety of different conditions presented by the facts.

California Rate Increases.—The Railroad Commission of California has authorized the Southern Sierras Power Company and the Holton Power Company to increase their rates for electric energy to an amount which will return 8.4 per cent. Consumers of the former company will pay an added cost of approximately 19.2 per cent, while consumers of the Holton line will pay an increase of about 10.4 per cent. As these companies are jointly owned, the increase to the public on the combined systems will approximate 16.5 per cent. At the same time the Sierras Power Company was directed by the commission to charge the Nevada-California Power Company 1 cent per kilowatt-hour for all energy delivered for resale to the Nevada customers of the utility. The commission has also authorized a revision in the rates of the Amador Electric Light & Power Company, operating in Jackson, which on the average will amount to an increase of lighting service of about 20 per cent and on power service of about 10 per cent.

Company Forbidden to Borrow from Depreciation Funds for Indefinite Period.—In denying an application from the Northern Indiana Gas & Electric Company for permission to borrow from the depreciation funds for an indefinite period of time rather than for a period of one year, as provided in the original depreciation clause, said money to be used for additions and betterments and not to be capitalized, the Public Service Commission of Indiana said: "The record does not disclose any situation peculiar to this company which would warrant the commission in modifying its general policy with respect to the handling of the depreciation reserve. If, for example, the petitioner were able to show the commission that in the past all realized depreciation had been taken care of and the property kept up to its theoretical perfect state of efficiency, then there might be some reason for the commission permitting money to be diverted temporarily from this depreciation fund for a period of more than one year and, in fact, for an indefinite period, provided, of course, it never were capitalized. The evidence, however, indicated that such was not the condition. On the other hand, the evidence was general and cumulative that not only realized depreciation has not been properly met but that maintenance even was deferred."

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies.

House Moving and Poles in Street as Nuisances.—In reversing a verdict awarding damages to a house mover (Ashwork vs. Birmingham Railway, Light & Power Company) because of the existence of poles belonging to the company in the street, which interfered with his plans, the Court of Appeals of Alabama held that the plaintiff should have alleged facts to show that his own proposed use of the street was not a nuisance. He should also have alleged that the poles were erected along the street without the consent of the municipality, or, if erected by its consent, were placed so as to constitute an abuse of the right granted, plaintiff's mere contention that the poles constituted a nuisance being insufficient. If, however, a house mover was prevented from the reasonable use of a street by the fault of the defendant power company in placing its poles, he was entitled to recover the reasonable difference in the cost of removing a house in the manner in which he did have to remove it over what it would have cost to remove it but for the power company's poles, not being entitled to any damages for delay, loss of time or use of tools or equipment. (86 So. 82.)*

Employer Held Responsible for Death Supposedly Caused by 110 Volts. —A verdict awarding damages because of the death of a workman from electric shock (Snyder vs. Wagner Electric Manufacturing Company) has been affirmed by the Supreme Court of Missouri, despite the contention of the defendant company that the man could not have died from this cause inasmuch as, even admitting a defect in insulation, only 110 volts could have passed through his body. In a similar case the Alabama courts recently decided in the company's favor. (See ELECTRICAL WORLD, Sept. 18, page 594.) In the Missouri action the workman, who was not an electrician, was in the act of removing a plug from a socket on a drop cord, in the course of his duties, when he dropped to the ground, expiring almost instantly. The court held that it was not essential for the petition charging negligence to show the source of the current and the course and means by which it reached the socket. It also found from the testimony of electrical experts that there were instances where death had been caused by the low voltage in question. (223 S. W. 911.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Men of the Industry

Changes in Personnel and Position— Biographical Notes

Henry Harris, who was elected president of the Pennsylvania Electric Association at its recent convention at Bedford Springs, Pa., has filled the office of vice-president of that association during the past year and been a member of its executive committee for the past five years. Mr. Harris is now president of the United Electric Light Company of Wilmerding, Pa., which was organized by him. He became identified with the electrical industry some twenty years ago and in the capacity of commercial manager for the Duquesne Light Company became well known as

HENRY HARRIS

a student of merchandising methods and an originator of efficient plans for selling electrical goods. Mr. Harris has been identified with the work of the National Electric Light Association as vice-chairman of the Commercial Section for two years and as chairman of the committee of co-ordination of advertising in the electrical industry. He has also served for five consecutive years as chairman of the rate committee of the Pennsylvania Electric Association.

Bert Dunkin, who has been cashier of the Albia (Iowa) Light & Railway Company, Albia, has been appointed acting manager to succeed Ralph W. Boyer, who has been general manager and treasurer. Mr. Boyer has been connected with the Guy M. Walker properties for the last eleven years and leaves to enter another line of business.

J. G. Lancaster of Sydney, N. S. W., has left Australia to become chief electrical engineer for Hay & Vickerman, consulting engineers, Wellington, N. Z., where he will have charge of some hydro-electric developments for the New Zealand government. Mr. Lancaster is a graduate of Canterbury College, New Zealand. He completed the engineering apprenticeship course of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., and for the last eight years has been engaged on industrial consulting work and on the design of the proposed city tube and suburban electric railways in Sydney, Australia.

P. T. Sealey, formerly captain 37th Engineers, U. S. A., combatant electrical and mechanical regiment, has been appointed general manager for the receiver of the Texas Gas & Electric Company, Houston, Tex.

J. A. Whitlow, heretofore general manager of the Pine Bluff (Ark.) Company, which is controlled by the Arkansas Light & Power Company, and also operating superintendent of the latter company, has been made traffic manager in charge of rates, appraisals and similar matters for the Arkansas company's properties. The duties of general manager at Pine Bluffs have been assigned to J. L. Longino, chief engineer, and those of operating superintendent to F. M. Wilkes, formerly commercial manager.

Lieut.-Col. William Kelly, who has been chosen chief engineer of the Federal Power Commission, is familiar with water-power matters on all navigable streams from his work for the chief of engineers. Colonel Kelly spent a year at the front during the war with Germany. After the armistice he was detailed by the Peace Commission to make a preliminary survey of the rivers internationalized by the treaty. This

LIEUT.-COL. WILLIAM KELLY

made it necessary for him to make a personal trip along the entire navigable course of the Rhine, Danube, Elbe and other rivers. He made a preliminary report and was succeeded by Walker Hines, formerly Director-General of Railroads, who was chosen to act as arbiter. Congress awarded a distinguished-service medal to Colonel Kelly. He was born in New York Jan. 8, 1877.

C. A. Semrad, who was elected president of the Colorado Electric Light, Power and Railway Association at its recent meeting at Glenwood Springs, Col., is general manager of the Western Light & Power Company, Boulder, Col. Mr. Semrad was born July 3, 1885, at Highland, Wis., and was graduated from the University of Wisconsin, College of Electrical Engineering, June, 1908. The following year he was an instructor in hydraulics and water power at the University of Wisconsin. He was then employed by the Union Light & Power Company, St. Louis,

C. A. SEMRAD

and in 1910 became cadet engineer of the Northern Colorado Power Company, receiving the appointment of general manager of the Cheyenne (Wyo.) Light, Fuel & Power Company, which is a subsidiary company of the Western Light & Power Company, in 1914.

Obituary

Elvin L. McGrew, purchasing agent and general traffic manager of the Standard Underground Cable Company, died Friday, Oct. 8, at the Imperial Hotel, New York City. Mr. McGrew became connected with the Standard Underground Cable Company in 1900. A few years ago he was a leader in the formation of the Purchasing Agents' Association of Pittsburgh, and he was its first president. Later he became prominent in the national organization. Mr. McGrew was born at New Alexander, Ohio, fifty-seven years ago.

Charles S. Davis, counsel for various public utilities before the Massachusetts commission in the past decade, died recently at Plymouth, Mass. He was born at Plymouth sixty-three years ago, was educated at Harvard College and was a member of the firm of Davis, Peabody & Brown of Boston.

Charles Sibley Gage, formerly attorney for the American Bell Telephone Company in New York City, died recently at Concord, N. H.

Trade and Market Conditions

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies—Notes on Industrial Activities and Business Methods

Increasing Jobbers' Stock Turnover by Manufacturers' Co-operation

PYRAMIDING or duplication of orders by many jobbers during the past year produced a rather confused situation among the manufacturers and the trade. The jobbers could not absorb the orders they placed nor could the manufacturers fill them. One result was a low rate of turnover for the jobbers. It became necessary for the closest co-operation to be effected in order to control the situation. The plan devised by the Edison Electric Appliance Company to meet the situation has been outlined by W. B. Pierce, Eastern sales manager of that company. Briefly it consists of a jobbers' stock and requirement survey which makes the status of the jobbers' stock perfectly clear to the manufacturer, thereby permitting him properly to prepare to meet the actual needs of the jobbers and so increase the rate of turnover of the latter's stock.

It is necessary for the manufacturer to relate his sales and anticipated sales to his production and to his raw-materials orders. His manufacturing schedule is carefully prepared for several months ahead and his materials are ordered accordingly, but the actual deliveries of the furnished product must follow the schedule or else the manufacturer will find himself with an overstock of undeliverable orders which would demoralize his business because of a low turnover. It was the desire to apply the scheduling principle to the jobbers' business that led the Edison Electric Appliance Company to devise the survey chart which was adopted.

Columns are provided on the chart to list the names of the various separate kinds of appliances and the following data regarding each: Stock on hand, in transit and total; dealers' orders being held; orders placed but not shipped, and requirements during various future periods. These charts are filled out quarterly.

The plan has been proved sound and well regulated. It provides for the manufacturer and his distributers acting as a unit and operating on the basis of carefully prepared quarterly sales estimates. It enables the manufacturer to work more closely to the requirements and permits him to obtain the maximum result from his production efforts. The jobbers have gained because their stocks move more rapidly and their rate of turnover, on which their profits depend, has been increased.

Simplex and Westinghouse Companies Win Heater Suit

ELECTRIC heater production by the Simplex Electric Heating Company, Cambridge, Mass., and by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., will continue without hindrance, according to a decision recently handed down by Judge F. S. Dietrich, United States District Court, District of Idaho, and entered in the Northern District of California. The issue was heard in the case of the Majestic Electric Development Company vs. Holbrook, Merrill & Stevens, distributers of Simplex radiators, the Westinghouse Company also being a defendant. The plaintiff contended that the invention of the reflector-type heater was fundamental. The court holds that nowhere in his patent application did the plaintiff suggest the view that he had discovered the principle of a "beam heater" or any fundamental idea in relation thereto, and the opinion points out at length that this principle was recognized and indeed utilized in the art before the plaintiff's patent was sought. The invention of nichrome wire solved the problem of a dependable and efficient heating element. When the right to its use was established heaters were put on the market in increasing numbers, and doubtless the plaintiff was to some extent the beneficiary of its competitors.

R. P. Ingalls, sales manager Simplex Electric Heating Company, stated to a representative of the ELECTRICAL WORLD on Monday that the decision had been fully expected by the defendants, and that it opens the way toward healthful competition. Distributers all over the country may now purchase freely from the manufacturers, Mr. Ingalls said.

The Majestic company, however, is advising the trade that the case will immediately be appealed to the United States Circuit Court of Appeals. Furthermore, this company states that these cases do not involve all of its patents and that it has still other patents which it thinks are being infringed by Simplex and Westinghouse and that suits will soon be brought on these patents. The trade is likewise informed by the Majestic company that this decision does not cover other than Westinghouse and Simplex devices and that with respect to other manufacturers the company intends to proceed with the protection of its rights. The Majestic company first brought suit for infringement by the Hotpoint heater and won on design patent. The Edison Electric Appliance Company, which manufactures the Hotpoint line, as a result has become licensed under the Majestic patents.

Lower Cotton Reflected in Prices of Insulation

LOWER prices of raw material have reacted upon the market for insulation of all kinds, according to representative manufacturers in this line and jobbers. The price of tapes, webbing, sleeving, cambric, both varnished and plain, and silk material has dropped slightly owing to lower cotton. Varnish, too, is a little easier in price. On the other hand, insulating papers, pressboard, etc., show no signs of a reduction, and in some quarters it is said that even higher prices may prevail there in view of the great scarcity of paper. No fluctuation is evident on mica. Opinions differ as to the probable tendency of prices on that material. One distributer reports that prices quoted from England are being slightly shaded, but on the other hand it is said that European countries have entered into competition as buyers of mica in India so strongly that the supply does not exceed the demand. One large company which does considerable business in built-up mica used in fractional motors and automobile ignition sets states that there is little or no demand from that quarter.

Questioned whether or not insulation prices have reached their bottom level most manufacturers state that the trend is almost entirely dependent upon raw material prices. It is pointed out in some cases that cotton has been contracted for some time in advance and that it requires from about eight to ten weeks before a drop in raw cotton is reflected in prices of finished insulation. For this reason some producers state that if cotton remains at its present low level or drops further, some additional softening of prices may result, but this readjustment will come about gradually if at all. Demand, while fair at present, is considerably less

than it was a few months ago, probably owing to price uncertainties, it is said. Some cancellations have been received, but outside of the automobile industry these have not been alarming. There have been requests for extensions of time on filling orders in a number of instances, however. Manufacturers agree that the present dullness is only temporary and that a good volume of business should develop after the first of the year. This optimistic tone seems to be quite prevalent in the field. One of the large interests reports that in spite of the recent decrease in demand the present year will show a volume of business one-third greater than ever before. Even at present, though individual orders are smaller, this company reports that the actual number of orders and inquiries is increasing. The most active buyers of insulating material just now are said to be the repair shops, and cable manufacturers are also ordering varnished cambric fairly well. Foreign demand is conceded to be on the increase, and prospects for orders from abroad are brighter. Inquiries are coming in from England, France Germany, Australia and the Scandinavian peninsula it is said.

Raw material, except for paper, is plentiful, but not all producers have been able to catch up with back orders, which in one representative instance are still piled up one to three months ahead. Deliveries are improving, however, and on some classes of material orders can almost be filled from stock. Paper material, both treated and untreated, is said to be in the worst supply.

Wire Prices Show Downward Trend

DEMAND for copper wire, both bare and insulated, is at a low level at present, according to manufacturers. This condition is attributed to the falling market, which automatically curtails buying until price readjustments are completed. Foreign demand is also light at present, though the exchange situation is partly to blame there. In some quarters it is stated manufacturers are curtailing production to guard against overstocking.

As a result of lower cotton, rubber and copper prices, there has been a general easing off of prices on the whole line of bare and insulated wire. This reduction has been gradual and varies according to type and size. One producer estimates the extent of the price drop to be from about 10 to 15 per cent. Opinions differ as to whether prices have reached their lowest level. In many cases manufacturers have contracted in advance for cotton. Copper prices are also held to be close to the margin of producing cost. In view of these facts one large wire producer at least is buying copper at the present time. On the other hand, a great many interests seem to feel that still lower wire prices may prevail, provided that raw materials remain at their present level or drop further. This view holds that lower raw-material cost, especially of cotton, has not yet had time to make itself felt fully. Bare wire base at present ranges from about 20 cents to 20¾ cents, compared with about 22¼ cents two months ago.

In general the view is expressed that demand will remain light for the rest of this year, but that starting next spring a good volume of business will develop. Buying may even start heavily before then, one manufacturer says, if copper and cotton should start to move upward. In the opinion of this company, a rush to place orders would then ensue that would tax the capacity of wire mills and leave many consumers who have waited "out in the cold."

A number of cancellations and requests for extensions have been received, especially from automobile manufacturers, but outside of that industry the number does not seem to be great. The chief reason for cancellations is felt to be the overbuying that has taken place in an effort to insure deliveries. Stocks, on the whole, are not large. One company has unfilled orders ahead for three months on certain sizes of weatherproof wire, and another is quoting deliveries of from six to twenty weeks on some sizes of insulated wire and four to six weeks on bare. Many sizes are available from stock, however. Magnet wire stocks are generally short and deliveries cannot be made from stock. One representative producer is quoting eight to ten weeks. Another manufacturer presents the exception to the rule by reporting a good stock of fine insulated wire but a short supply of the large sizes, which in that case are meeting a stronger demand.

Prices generally are very unstable and, as one manufacturer puts it, are "all over the lot." No prices can be quoted on going to press which can reasonably be expected to hold over publication date.

Washing Machines Entering Strong Buyers' Market

REPORTS from many of the washing-machine manufacturers are to the effect that all orders may be immediately filled, which would indicate that orders are not at this time exceeding the production capacity. At the September meeting of the association of American Washing Machine Manufacturers the expressed opinion was that prices would not quickly recede, and it is reported that the feeling at the meeting was that not before Jan. 1, 1921, would there be a change in prices. One manufacturer's representative has stated that his company is now willing to guarantee present prices for six months.

That prices are not stable, however, is indicated by a very recent recession in the prices quoted on two machines. No reasons were given for this, as it is claimed that there has been no change in labor costs, which constitute a very large proportion of the factory expense. Other manufacturers, while admitting that a strong buyers' market is apparently setting in, would not admit that lower prices could be expected in the near future.

Metal Market Situation

COPPER prices within the past week have declined from 1 cent to 1¼ cents per pound on all positions. Offerings as low as 16 cents are reported in the outside market, but sales even at this figure are small. Consumers apparently believe that 16 cents will be shaded and are holding off buying. For prompt shipment, f.o.b. refinery, from 16 to 16¼ cents is generally quoted by second hands, and 16¼ to 16½ cents f.o.b. refinery, covering the first quarter of next year. This is equivalent to ¼ cent more for these same positions delivered. Copper at 16 cents is the lowest level touched by the metal since early in 1919, when it sold down to 14⅝ cents. The present price is said to be only 4 per cent above the average for the past ten years and nearly 38 per cent below the prevailing prices during the war.

Producers' prices are entirely nominal. It is reported that orders would be accepted at 17 cents, but the large interests take the stand that since there is no demand it is useless to quote in competition with the outside market prices. Foreign demand remains off. Standard spot copper at London broke more than £3 in price the past week under the disquieting effect of the coal miners' strike in England.

The official price of lead has been further reduced ½ cent. A cut of 2 cents per pound also occurred in the price of aluminum last week. Straits tin declined 4½ cents; while antimony and zinc followed suit with drops of a fraction of a cent each.

NEW YORK METAL MARKET PRICES

	October 11	October 12
Copper	£ s d	£ s d
London, standard spot	96 10 0	93 5 0
	Cents per Pound	Cents per Pound
Prime Lake	17.75	16.50
Electrolytic	nominal	nominal
Casting	17.00	15.75
Wire base	21.00	19.00–19.50
Lead, trust price	7.75	7.25
Antimony	6.62½–6.87½	6.50
Nickel, ingot	43.00	43.00
Sheet zinc, f.o.b. smelter	12.50	12.50
Zinc, spot	7.55–7.65	7.50
Tin	42.00	37.75
Aluminum, 98 to 99 per cent	35.10	33.10

OLD METALS

	Cents per Pound	Cents per Pound
Heavy copper and wire	14.75–15.00	14.50–15.00
Brass, heavy	8.00– 8.25	7.50– 8.00
Brass, light	6.50– 7.00	6.50– 7.00
Lead, heavy	6.00– 6.25	5.75– 6.00
Zinc, old scrap	4.50– 5.00	4.50– 5.00

THE WEEK
IN TRADE

NOT much change is noticed in the market this week. In New England prices are again stiffening and also in a measure along the Atlantic seaboard. Elsewhere prices have, if anything, been softening. Wire is dropping rapidly in price following the raw-materials market. Transportation is generally improving and stocks as a result are commonly large. Rigid conduit, however, is still somewhat short, especially galvanized. In fact, all galvanized products seem to be hard to obtain.

Except for the Chicago district, there is no improvement in collection, and in some places it is taking still longer to collect outstanding accounts.

Retailers still are hesitant about ordering their Christmas stocks, in spite of the fact that it is difficult to obtain stocks of many of the smaller socket devices.

Building is slackening very rapidly and is now probably as low as it ever was, with no prospects of any immediate improvement.

NEW YORK

During the past week the volume of business has undergone no material change over the previous week. A checking of the actual sales billed in some instances has shown that the market has stabilized to a considerable extent, and this has encouraged a spirit of conservative optimism for the immediate future. Prices are still unstable to the extent that quotations are being adjusted to meet the demands of the buyers. Wire has shown marked price recessions.

Transportation continues to improve as both receipts and shipments are being handled quite satisfactorily.

Collections have not shown any great improvement, yet there is a decided feeling that it would be unwise further to tighten up collections at this time as such a program would probably work a great hardship on a good many customers.

Schedule Material.—Demand has weakened and stocks are spotty. Sockets and other items which contain porcelain continue scarce.

Rigid Conduit.—Stocks are spotty; a few jobbers report stocks up to five carloads, although the larger sizes are hard to obtain. Quotations vary widely; ½-in. black pipe is quoted at $85 to $92 per 1,000 ft.; 1-in. black pipe is quoted at $170 per 1,000 ft. The demand continues good.

Wire.—The past week has seen marked recessions in wire. Base prices have been reduced to 21¼ cents for bare wire, rubber-covered to 25 cents, and weatherproof is quoted by one large producer at 24 cents. Jobbers' quotations on No. 14 rubber-covered range from $10 to $11.50 per 1,000 ft. Further reductions are anticipated.

Christmas Business.—No strong demand has been felt, although such supplies as have been received have been quickly taken.

Lamps.—The fall demand is running at the expected rate. Shipments are coming through in good shape with the exception of some of the larger sizes which are rather difficult to keep in stock.

Washing Machines.—The electrical show has apparently caused a slight increase in sales. Prices in general have held steady, although one or two manufacturers have dropped their prices toward those quoted prior to the middle of July.

Heaters.—The rush of sales during the cool weather of a few weeks ago has flattened out and sales are steady. Deliveries are fair and stocks good.

Flexible Metallic Cable.—The market is weak. One jobber reports a ten weeks' stock with sales coming in in small lots only. Prices have dropped off a bit to $85 to $90 per 1,000 ft. of No. 14 two wire.

CHICAGO

The exact condition of the construction industry in this district is shown by the fact that during September, 1920, building permits in Chicago were issued to the extent of slightly less than $4,000,000. This compares with $13,500,000 in September, 1919. With the coming of winter, when but few construction undertakings are normally begun, contractors and contractor-dealers are facing a dull season. This is being reflected in demand on jobbers. At the present rate of business adequate stocks on all lines of electrical construction materials will soon be in hand.

Retail demand continues light. The average buyer, reading that the delegates to the National Convention of Purchasing Agents stated that prices were due for a drop of from 20 to 50 per cent, is withholding purchases, looking for that drop. It is a queer fact that the electrical industry is now a sufferer merely because it refused to profiteer during the period of prosperity. The public, not familiar with conditions, feels that electrical goods should share with other lines in the price cutting and will have to be educated to the fact that radical cuts are impossible.

Collections are slightly improved. In a measure this is because billing is not proceeding at so high a rate as formerly and customers are getting a chance to catch up.

Fractional-Horsepower Motors.—Decreased consumption by household-appliance manufacturers and increased output due to superior labor efficiency are causing the supply of small motors to exceed demand by almost 100,000 a month, according to the estimates of several interests in a position to know. No announcements have been made of price reductions, but it is stated that offers to buy in quantity would probably induce shading of lists. Some few special types are still hard to get.

Black Conduit.—Orders are materially reduced through stagnation of construction, and supplies are approaching normal in most sizes. Contractors report a greatly lessened demand. So far as can be learned lists are strictly adhered to.

Non-Metallic Flexible Conduit.—Adequate supplies are being received from manufacturers, and jobbers' stocks are well filled. Some price cutting is reported, but not of sufficient extent to affect the market in general.

Poles and Cross-Arms.—Demand from municipalities continues at a good rate. Public service corporations also remain in the market and, as their expenditures have been kept at a minimum for a long time, will probably be forced to keep up buying at a steady rate to maintain their lines. Steadily improving transportation is making itself felt in greatly improved deliveries. Stocks in the various pole yards throughout this section are being built up to normal.

Galvanized Strand.—Supply condition is materially relieved. Not all jobbers have stocks and none have full stocks, but strand can now be obtained in thirty days or less on almost all sizes. Business should be good on this item for some time to come, as all factors including the consumer have been very short for some time.

Electric Ranges.—Unusual interest, previously noted, continues in this line. Appealing principally to the highest class of retail trade, the popular idea of waiting for a cut has affected it but little. Prices are firm.

Washing Machines.—Manufacturers, three of whom have advanced their prices during the past few weeks, state that actual sales by makers have been better each month this year than in the corresponding month last year. Several plants, recognizing the fall-off in retail sales, have curtailed production, while others are still running at capacity and finding no difficulty in disposing of production.

Christmas Goods.—Retail dealers seem uncertain as to how heavily they want to buy for the approaching season. Most of the big stores already have their stock in and report encouraging inquiries from their customers at this early date, but the volume of business to be done by the small dealer is still a question. Jobbers' stocks are good.

BOSTON

An active upward swing in wiring material prices is the leading feature of the Boston electrical market during the past week. The price-cutting movement of a fortnight ago appears to have run its course. Some overstocks have been relieved, but the lower quotations stimulated little business in comparison with the volume of orders going through, which is still holding up extremely well. Collections are fair and are being followed very closely. Most of the jobbers in Boston are buying very conservatively at present and are reducing their stocks as much as possible before replenishing. All evidences point to the largest yearly gross business ever handled in this section.

General business conditions are somewhat unsettled. The labor market bears signs of improvement. Building and engineering contracts in New England from Jan. 1 to Oct. 13 totaled $261,876,562, against $171,074,000 for the same period last year. For the quarter ended Sept. 30 the value of building construction in twenty-three Massachusetts cities totaled $19,216,582, compared with $22,476,096 for the quarter ended June 30. The indications are that the peak of building has passed for this year.

Heaters.—Intensive production at the manufacturing plants is yielding excellent deliveries, and the volume of orders going to the jobbers is excellent. Prices are firm and raw materials plentiful. Mild weather has held back the retail trade somewhat. List less 30 per cent is quoted on lots of six or below. The Majestic patent suit against the Simplex and Westinghouse interests was not sustained.

Wire.—Rubber-covered wire has advanced slightly. No. 14, in 5,000-ft. lots, is selling at $10.50 per 1,000 ft. Stocks are in good shape. Weatherproof base is now ranging from 26 cents to 27 cents. No complaint is heard about getting orders filled.

Rigid Conduit.—Stocks are spotty, with vigorous demand. The supply of ¾-in. pipe and of some large sizes is very low. Quotations are steady, representative prices being: Galvanized, 1-in., $200 per 1,000 ft., and ½-in., $102; for 1-in. black pipe, $189.50 is charged and for ½-in. black, $96.

Non-Metallic Flexible Conduit.—Quotations are up from last week's level. Good stocks are in hand, and the ⅜-in. size brings $33.50 per 1,000 ft., in 5,000-ft. lots. For ½-in. loom the buyer is paying $36.50. A fair demand exists.

Ranges.—Business is rather dull. Ranges are being made up for stock against the expected demand of next spring.

Heating Pads.—Brisk trade is being handled, with very active production at the factories. Reductions in the cost of cotton have not found their way into heating pads to any extent, owing to the small amount of this material represented in the total manufacturing cost.

Sockets.—Prices stiffened during the week to 47.5 cents net on pulls, 28 cents on keys and 26 cents on keyless, in case lots. Plenty of sockets are obtainable for current needs. A healthy demand prevails.

Motors.—Sizes below 10 hp. in so-called standard makes are hard to obtain complete with pulleys. A slow improvement in deliveries, however, is apparent from week to week, taking the trade by and large. Prices are firm.

Knobs and Tubes.—Stocks are somewhat spotty. "Nail-it" knobs are plentiful, and steady at $32 per 1,000 in lots of 4,000 or over. Tubes are in better supply but cleats are very short.

ATLANTA

The report of the Department of Agriculture shows that only one-half as many bales of cotton have been ginned up to date this season as was the case in 1919 and that a large percentage of these bales are not being marketed by the owners. A number of heavy cancellations of tire-fabric orders by the automobile tire manufacturers have caused several of the large mills in the section to curtail hours of operation materially and are also causing a hold-up in mill construction. Jobbers, as a result, report very few new orders from the textile trade. The agitation in the rural districts in connection with the marketing of the new cotton crop is causing considerable uneasiness and is reflected by the falling off in orders from these districts and the collection of outstanding accounts.

The transportation situation continues to improve, and all jobbers report the accumulation of satisfactory stocks in nearly all lines. The general underlying tone is that business will continue to be satisfactory, even though grave fears are being expressed of the permanent bad effects from the sharp break in the price of cotton. A few price reductions are to be noted during the past week.

Washing Machines.—Jobbers report the past month as being the best in some time, the demand having shown considerable increase while shipments of stocks are reported very satisfactory.

Wire.—A change in the discounts on rubber-covered wire has caused a reduction in price. Jobbers report excellent stocks with practically no back orders on hand. The goods are moving briskly and shipments are reported satisfactory. Weatherproof is quoted at 27 cents and rubber-covered at 26 cents base.

Dishwashers.—This specialty continues to increase in popularity, and jobbers anticipate a brisk sale during the coming winter months. A price reduction of $25 off the list is just announced.

Heating Devices.—Jobbers continue to complain of their inability to accumulate stocks for Christmas trade. There is a general shortage, with the exception of irons, and apparently little prospect of better conditions in the next few weeks.

Conduit.—A reduction of 15 per cent in price is announced by one of the largest jobbers, despite the fact that stocks as a whole continue very spotty. Fair supplies of some sizes of black pipe are in the market, but galvanized continues short.

Steel Reflectors.—An unusually good season is reported on reflectors and accessories. Heavy orders continue to be received and shipments are quoted at twenty-four weeks.

Flexible Non-Metallic Conduit.—Stocks are in excellent shape, one or two firms really reporting a supply in excess of their requirements. The normal demand continues, with prices on ⅜-in., $30 per 100 ft.; ¾-in., $32 per 100 ft.

ST. LOUIS

In spite of the tendency to cut prices reported from other sections of the country, St. Louis jobbers report very few cases of price shading. These particular cases are on items which have become overstocked through the delivery by the manufacturer of large back orders which cannot be disposed of normally. This situation is causing a number of cancellations by jobbers. On a good many other items jobbers are instructing the manufacturer to hold their orders until further notice.

A practice which is helping to balance stock and demand here is that of interchange of stocks by jobbers. A meeting of jobbers from St. Louis, Kansas City, Omaha and Des Moines held this week brought out the fact that this practice has had a large part during the past few months in keeping down overstocks and catching up on back orders. An instance in point was the shipment of a large number of heaters by an Omaha jobber with an overstock to a St. Louis jobber who was behind in his orders.

Market conditions have changed very little during the last week. Jobbers' stocks in most lines are good, with only a few shortages, most of which are common to the country at large and which have been caused by general economic conditions. Buying is very conservative, particularly retail buying. Industrials and utilities are buying more freely than the retail trade, but it is not expected that the volume of business for October will be any larger than that of September, which was a subnormal month. Collections are difficult and have lengthened on an average by fifteen days.

Rigid Conduit.—There is a fair stock of 1-in. and 1½-in. black, but stocks of 1¼-in. black have become spotty. Demand is fair. One-half inch and ¾-in. black are still very short, a small supply of ¾-in. reported several weeks ago having become exhausted. Stocks of galvanized are spotty.

One-half-inch is quoted at $80 per 1,000 ft., ¾-in. at $110 per 1,000 ft., and 1-in. at $148 per 1,000 ft., all in lots of 5,000 ft. or more.

Guy Wire.—Stocks have shown no sign of improvement in the last six weeks, and St. Louis manufacturers are still having difficulty in getting the galvanized-steel wire from the mill with which to make the strand. No time for the termination of the shortage can be predicted. Prices have stiffened, but because of the inability to promise any specific delivery there is no basis for a standard quotation, prices ranging from $1.75 to $1.90 per 100 lb. for galvanized stranded-steel wire according to the order.

Twin Lead-Covered Wire.—There are good stocks here and immediate deliveries can be made. Manufacturers are quoting one month delivery on direct shipment. A representative price is $67.86 per 100 lb. of 600-volt, duplex, No. 8, in lots of 1,000 lb.

Porcelain Insulators. — The 33,000-volt insulators are scarce and in good demand. Stocks of 6,600-volt insulators are somewhat better but are far from complete. Demand for these is good also.

Schedule Material.—Stocks of some items are spotty, but there is an abundance of pull sockets and some jobbers are reported to be willing to shade prices on these to cut down their stocks. The demand for schedule material is spotty and on the average much below normal.

Radiators.—Stocks in the whole territory are in good shape, numbers of jobbers and dealers having carried over quantities from last year. Demand is shaping satisfactorily, according to the retailers, and the several short cold snaps experienced so far have shown a good movement. This past week the demand has been slow.

Bare Copper Wire.—Very few jobbers carry stocks, but they can quote shipment from the factory with delivery in a few weeks. The current price on No. 8 in 200-lb. lots is $26.50 per 100 lb., and on No. 10, $29.50 per 100 lb. These prices are felt to be high owing to the movement of the electrolytic copper market and are not firm.

SALT LAKE CITY—DENVER

There is little or no improvement noted in the electrical market. Consumer demand is at a low ebb. Dealers buy only as they sell and jobbers are trying to reduce their stocks. The public is still in a waiting attitude, holding for a decline of prices that dealers and jobbers cannot foresee. Prevailing prices in all lines of electrical merchandise seem the big obstacle to larger sales.

Consumers are suspicious of exorbitant prices and refuse to buy until there is a decided recession. Consequently only such commodities as are absolute necessities are in demand. Dealers and consumers alike would welcome a reduction in price schedules and freely admit that it should come. There is no indication, however, that the immediate future will see a substantial decline. In fact, some manufacturers are advising their jobbers that present prices, if not higher prices, will obtain for the next few months.

The labor market is settled. There is little agitation and no strikes imminent. Building remains somewhat at a standstill. Contractors find times rather dull, with little promise of immediate improvement. Transportation is slow and vexatious. L. c.l. shipments that normally require three weeks from the Atlantic seaboard now take from four to six weeks. Even carload shipments drag out from three to four weeks. In Salt Lake City electrical interests have effected a co-operative organization and will soon launch an intensive advertising campaign. Great interest centers in the projected canalization of the Lower Snake River, which will afford a deep water inlet to Lewiston, Idaho. Representatives of the United States Board of Engineers have already made a preliminary survey. If the project is carried out, great power plants will be established at the dams to supply energy for manufacturing industries.

Wiring Materials.—Conduit, porcelain, sockets, etc., are selling very well. Stocks are not ample to meet the demand.

Lamps.—Trade is brightening, which of course is the expected thing at this season. Dealers are well stocked to meet a wide diversity of demand.

Irons.—Consumer demand is steady, though not brisk.

Washers.—The market is decidedly a consumers' market. Sales are made only through intensive methods of advertising and selling. Liberal time payments are the rule.

SEATTLE—PORTLAND

Jobbers in Seattle and Puget Sound cities as a whole report good sales, especially in domestic appliances and lamps. Heaters, toaster stoves, ironers and washing machines are moving especially well. Sales of heavy power apparatus are negligible and house-wiring device sales are light. Dealers report increasing counter sales, especially in washing machines and heaters. Stocks, generally speaking, are in good shape and shipments from the East are coming through satisfactorily with but few exceptions. The exceptions are ranges, percolators and porcelain material, although in the case of latter demand is very light owing to building slackness. A recent hail and rain storm in the "Inland Empire" section—eastern Washington—damaged the wheat crop being harvested approximately 25 per cent. The same storm damaged the prune crop in parts of Oregon to considerable extent. It is authoritatively stated that this will have no small effect on sales of farm-lighting outfits and appliances in these districts.

Portland manufacturers report that business is quieting down somewhat. Credit is tightening and collections are slowing up, although they are not bad at present. There is a general feeling that considerably quieter business, which will endure for a short time, is approaching. Jobbers state that business continues good, although it is not picking up as much as has been expected. The lamp and reflector business is increasing very materially. Another small drop in the price of wire is reported for the past week. This makes a total of approximately 13 per cent drop within two weeks. Electric ironers have increased in price, otherwise there are very few price changes of note. There is a tendency by the dealers to withhold buying, awaiting lower prices. Partly as a result of this there is some uncertainty in regard to the matter of increasing prices due to freight increases. One very prominent line of farm-lighting sets has recently lowered its price $600. There is some feeling that the cut may perhaps be of a temporary nature.

SAN FRANCISCO

Business continues quiet, and hand-to-mouth buying seems again to be the rule. Outside of certain large building jobs and certain urgently needed residence building, there is little new work reported in San Francisco, although building continues very large in volume in southern California. What may be called the valleys in the building load are partly filled by such missionary work as range wiring and improved industrial lighting. The threatened strike of all building trades in San Francisco is being arbitrated and has probably been averted. All lighting and power restrictions such as have been effective in the bay cities for the past month have now been abrogated.

Collections are averaging just short of fifty days, principally because of the activity of credit men in getting in long-standing accounts and the way in which they keep tabs on dealers' customers, instructing dealers to be cautious over the contracts into which they enter with consumers. The "Morris Plan" people report many new accounts, resulting from intensive device campaigns.

Appliances.—Appliance shipments from Eastern factories are very poor, and many customers, even those who have long-outstanding orders, will be disappointed in their Christmas stocks. Generally speaking, jobbers are not soliciting orders for percolators, toasters, etc., realizing that they will be hard put to it to care for their regular customers.

Conduit.—Local flexible metallic conduit stocks are very poor with little relief in sight. Stocks of fittings are slightly better but uneven in quantity. Flexible non-metallic conduit stocks on the contrary are too large.

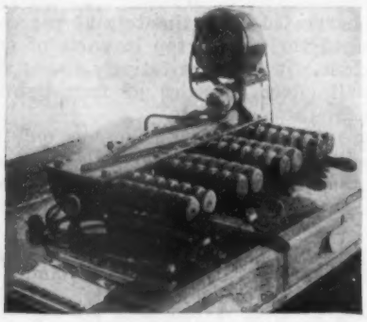
Boxes.—The decreased demand for roughing-in material and better shipments from the factory are the causes which are creating surplus stocks of boxes.

NEW APPARATUS & APPLIANCES

A Record of Latest Developments
and Improvements in Manufacturers' Products
Used in the Electrical Field

Motor-Driven Razor Sharpener

In the machine for resharpening safety razor blades developed by F. W. Cochrane, 3917 South Western Avenue, Los Angeles, Cal., a departure from the usual type of such machines is made in

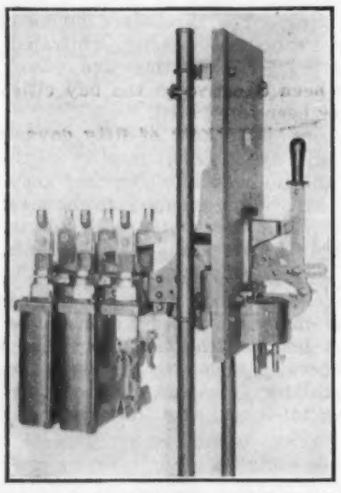


FAN-TYPE MOTOR DRIVES NEW RAZOR SHARPENER

that the blades move laterally with reference to the sharpening rollers, of which there are four sets, the first being faced with felt, the second being the honer, the third the stropper, and the last faced with horsehide. The machines are in two sizes, for twelve blades and for six blades, and are driven by Westinghouse motors.

Standardized 7,500-Volt Oil Switches

Two new types of standard unit oil circuit breakers for use on systems up to 7,500 volts have been developed by



TRIPLE-POLE BREAKER MADE UP OF STANDARD UNITS

the General Electric Company, Schenectady, N. Y. These breakers, known as FK-35 and FK-35-Y respectively, are so constructed that single, double, triple or four-pole breakers can be made up by combining the required number of units—one for each pole, plus frame, breaker mechanism and operating mechanism.

Adjustable Ground Clamp

An adjustable ground clamp of tinned copper which conforms to the latest requirements of the code has been brought out by the Gillette-Vibber Company, New London, Conn. This "Gee Vee" clamp is made in three sizes to accommodate pipe from ⅜ in. to 3 in. It is claimed that the tighter the bolt which holds the clamp onto the ground pipe is screwed the more securely is the ground wire held to the pipe.

Small Amplifier and Detector

Of unusually small dimensions is the single-stage amplifier developed by the Acme Apparatus Company, 27 Windsor Street, Cambridge, Mass. The apparatus contains all the essential parts except the vacuum tube and batteries, and nevertheless measures only about 3½ in. x 3½ in. x 5½ in. An "Acme" transformer is included in the unit. A detector has also been developed by the same company, of the same dimensions. The binding posts on these pieces of apparatus, the maker says, are so arranged that a detector and two-stage amplifier can be made with separate filament control and the same batteries.

Unit-Type Geared Turbine and Generator

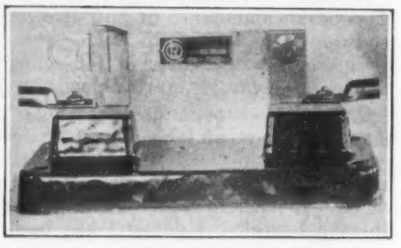
The Steam Motors Company, Springfield, Mass., has developed a geared turbine for mounting on the same base with a generator, thus producing a rugged unit-type outfit. The set, known as a "Steamotor" unit, has a two-row impulse turbine wheel of standard construction, a gear manufactured by the Fawcus Machine Company, and is complete with all the usual steam-turbine auxiliaries such as governor, emergency governor, pressure lubricating system and oil cooler. The units are in capacities ranging from 59 hp. to 300 hp., with turbine speeds ranging from 2,000 to 5,200 r.p.m. A typical unit of 100 hp., having a two-to-one ratio and a 3,200 to 4,000-r.p.m. turbine, has an over-all length of the steam end only of 36 in., an over-all height of 35 in. and a width of 28 in. The height from the base to the center line of the low-speed coupling is 11 in.

Laboratory Sterilizers

A combination sterilizer for instruments and dressings made in three sizes has been developed by the Prometheus Electric Company of 511 West Forty-second Street, New York. The heaters are for 110 volts to 250 volts and are equipped with fusible members designed to open the circuit in the event of abnormally high temperatures resulting from absence of liquid. Two compartments are provided in each of the three sizes, one compartment for instruments and the other for dressings.

Porcelain Base Switch

A 6,600-volt, 200-amp. switch which has a porcelain base to decrease the weight and improve the insulation between the switch and the support has been placed on the market by the Lewis

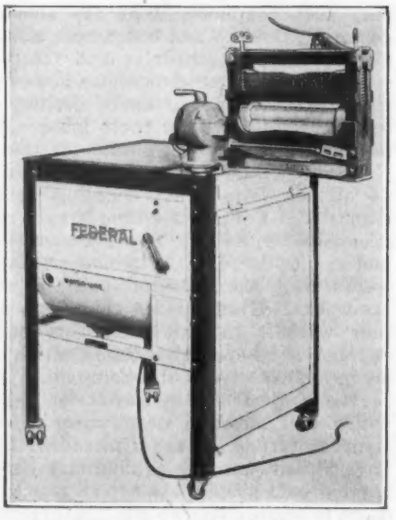


THE PORCELAIN BASE IS HOLLOW

& Roth Corporation, Philadelphia. The large creepage distance is held to be an advantage where great attention to maintenance cannot be given.

Rocker-Type Washing Machine

A new washer was displayed by the Federal Electric Company, 8700 South State Street, Chicago, Ill., at the recent New York Electrical Show. The "Roto-Phor" swinging wringer with which the washer is equipped is reinforced by a "T" iron brace across the bottom. The washer employs a rocking wooden tum-



COVER OF TUMBLER ALWAYS STOPS ON TOP

bler, suspended in a tub full of soap-filled water. The tumbler always stops with the cover on top.

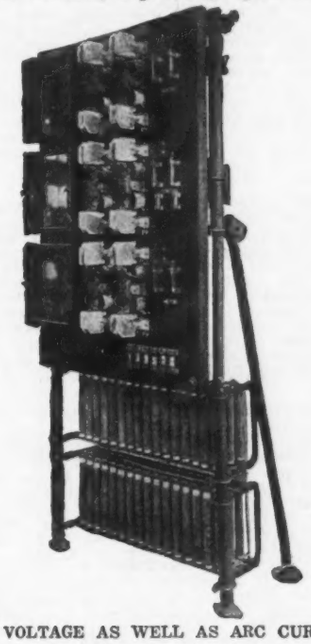
Household Dishwasher

A new electric dishwasher for household use has recently been designed by G. S. Blakeslee & Co., Cicero, Ill., with a capacity of 100 dishes besides silverware. It occupies a floor space of 22 in. x 36 in. and is 35 in. high. At the side is an opening for adding water, and the machine can be attached to a waste pipe if desired. It is run by a ¼-hp. motor and is attachable to any lamp socket.

A leaf at one end of the washer may be raised when the machine is not in use, making an aluminum-top kitchen table, 22 in. x 54 in. The washer is also made in a smaller size with a capacity of sixty pieces.

Electric Arc Furnace Regulator

High electrode operating speed and close precision of regulation, with absolute freedom from hunting, are the two important features of the electric arc-furnace regulator just placed upon the market by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. Speeds of 2½ ft. to 3 ft. per minute, depending upon the degree of divergence from normal in the quantity under regulation, and 5 per cent precision are claimed. The ability of this regulator to incorporate high speed with a narrow current zone is due to the fact that the electrode speed tapers all the way from full to zero as the regulated current approaches its normal value.



ARC VOLTAGE AS WELL AS ARC CURRENT CONTROLS MOTORS

Radio Tube Panels

Uniform in size, arranged for easy connection to make a set, and yet flexible enough to permit any desired groupings, is the series of panels recently developed by the Clapp-Eastham Company, 139 Main Street, Cambridge, Mass., manufacturer of radio apparatus. Each panel is of bakelite, ¼ in. thick, 4½ in. wide and 5½ in. high. Type "Z. R. D." tube control or detector panel includes, in addition to the panel and base, a filament rheostat of special design, two pairs of rubber binding posts for connection to "A" battery and inductances respectively, a special plug connector for telephones which will take regular telephone cord tips, and a high-grade tube socket complete with all wiring. Type "Z. R. A." one-stage amplifier panel includes, in addition, an amplifying transformer and a pair of binding posts for connection to "B" battery. A pair of binding posts is provided, however, for telephone connection in place of the plug connector, making it a simple matter to connect two of these amplifiers side by side to make a two-stage amplifier.

Insulating Cloths

Treated cloths for insulation purposes are being placed on the market by the General Electric Company, Schenectady, N. Y. It is stated that these cloths are woven from long fibered yarn treated to remove the nap. These cloths are made in both yellow and black and in linen, silk and canvas.

Electric Cloth Cutting Machine

A light-weight cloth-cutting machine driven by a small motor which will run on direct or alternating-current, the whole weighing 4½ lb., has been brought out by the Eastman Machine Company, Buffalo, N. Y. The machine will cut up to ¼-in. thickness of cloth at a time and is said to be very easy to operate.

FOR LOW THICKNESSES OF CLOTH

Notes on Recent Appliances

Fruit Juice Extractor

A motor-driven fruit-juice extractor has been placed on the market by the Blessing Manufacturing Company, 1834 Broadway, New York City.

Sterilizer

An electrically operated sterilizer for the use of drug stores and sode fountains has been brought out by the Steroelectric Company, Muncie, Ind.

Motor-Driven Ironer

A motor-driven ironer has been brought out by Gould Appliance Company, 7 West Forty-second Street, New York City.

Shade Holder

The E. H. Freeman Electric Company, Trenton, N. J., has placed on the market an attachment for supporting a shade from a standard receptacle.

Renewable Fuse

A renewable plug fuse has been placed on the market by the Ree-Nu-It Electric Manufacturing Company, New Bedford, Mass.

Appliance Cord

A portable appliance cord has been placed on the market by the R. W. Lillie Corporation, 30 Church Street, New York City.

Two-in-One Plug

The Union Appliance Company, 103 Mott Street, New York City, has placed on the market a double-service plug.

Light for Theater Aisles

A lighting unit for theater aisles has been placed on the market by the Chicago Electric Light Company, 2219 West Grand Avenue, Chicago, Ill.

Radio Oscillator

A constant-frequency radio oscillator has been brougt out by the General Radio Company, Cambridge, Mass.

Spotlight

A small incandescent lamp spotlight was recently placed on the market by the Chicago Cinema Equipment Company, 820 South Tripp Avenue, Chicago, Ill.

Electric Boiler

An electric boiler in 5-gal. to 20-gal. sizes is being offered by the Riverside Boiler Works, Inc., 491 Main Street, Cambridge, Mass.

Vacuum Clothes Washer

The Splitdorf "Aurora" electric washer is a new machine sold by W. B. Hart, 46 East Forty-first Street, New York City.

Electric Washer

The Pittsfield Machine & Tool Company, Pittsfield, Mass., has placed on sale an electric washer under the trade name of "Berkshire."

Incandescent Lamp Hanger

A lamp hanger is being offered by the Thompson Electric Company, 226 St. Clair Avenue, N. E., Cleveland. Ohio.

MANUFACTURERS' ACTIVITIES

Record of Changes Affecting Sales and Distribution Together with Trade Personals and Notes on Foreign Trade, Jobbers' News and New Trade Literature

MERRILL, SWEENY & COMPANY, 50 State Street, Boston, have recently changed their corporate name to M. H. Merrill & Company.

THE C. W. HUNT ENGINEERING CORPORATION, with offices at 143 Liberty Street, New York City, has been formed for the purpose of handling all sales entailing engineering in connection with the Hunt products and all engineering services previously performed by this company.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY has added a new foundry building, 120 x 120 ft., to its South Philadelphia works to make castings that weigh a half pound up to a half ton. Other additions recently finished there are a three-story warehouse, with 86,650 sq. ft. of floor space, and two pattern storage buildings, 30 ft. x 256 ft. The extensions will practically double the employed force at South Philadelphia, which now numbers 3,500.

LANDERS, FRARY & CLARK, New Britian, Conn, has called a stockholders' meeting for Nov. 2, for the purpose of authorizing an increase in the capital stock from $6,000,000 to $7,000,000, as recommended by the directors it is announced. Funds derived from the sale of the stock, which is offered at $25 a share, will be used for plant extensions and working capital.

REORGANIZATION OF UNIVERSAL PRODUCTS COMPANY.—Announcement is made of the completion of plans for an increase in capitalization of the Universal Products Company of Sandusky, Ohio, and Oshkosh, Wis., to $500,000. The plans include the purchase of the H. C. Doman Company of Oshkosh and the removal of the main offices from Sandusky to Oshkosh. The new company will continue to manufacture the Universal Products electric lighting and power plants and the Doman marine engines. The company will immediately go on an increased production schedule, made necessary by the large field organization developed during the last year. The officers of the new company will be: President, L. E. Willson; vice-president, R. K. Schriber; secretary, Charles H. Eichinger; treasurer, Louis Schriber.

GEAR MANUFACTURERS TO MEET NEXT WEEK.—Standardization and costs are closely related and for this reason will be the principal subjects discussed at the semi-annual meeting of the American Gear Manufacturers' Association, which will be held at Mohonk Lake, N Y., Oct. 27, 28, 29. Among the speakers will be P. G. Agnew, secretary of the American Engineering Standards Committee, whose subject will be "Standardization from the Point of View of the American Engineering Standards Committee"; Calvin W. Rice, secretary of the American Society of Mechanical Engineers, who will speak on "Standardization"; C. L. Collens, II, president of the Reliance Electric and Engineering Company and past-president of the Electric Power Club, whose subject will be "Industry Organization," and Christopher Haigh, supervisor of costs General Electric Company, who will describe the "Machine Rate Method of Distributing Expense." At an informal banquet to be held Thursday night, Oct. 28, Charles W. Woodward, vice-president in charge of personnel for the Hydraulic Pressed Steel Company, will be the principal speaker, taking as his subject "The Human Element in Industry." The American Gear Manufacturers' Association has received requests from Canada, England and Australia for copies of standards and recommended practices for the gear industry.

THE ELECTRIC APPLIANCE COMPANY, Pittsburgh, Pa., has applied for an increase in capitalization from $300,000 to $400,000. The company is incorporated under a Delaware charter.

THE WILLIAM A. CORRAO ELECTRIC COMPANY, St. Louis, Mo., has increased its capital stock from $11,000 to $22,000.

THE NATRONA POWER COMPANY, of Casper, Wyo., announces an increase in capital stock from $500,000 to $1,000,000.

CHARLES S. BEARDSLEY has accepted the position of sales manager of the Apex Electrical Distributing Company, Cleveland, Ohio, after a very successful connection with the United Electric Company, Canton, Ohio, where for three years he was general manager.

THE GENERAL ELECTRIC COMPANY, Schenectady, N. Y., is contemplating an addition to its Lynn (Mass.) plant to cost $150,000. The building is to be of brick, concrete and steel and will be 300 ft. x 160 ft.

Supply Jobbers' Notes

CHARLES H. BAY, at present appliance manager for the Detroit Edison Company, has been appointed household sales specialist for the Western Electric Company, Chicago. He will assume his new duties on Oct. 15.

JULIUS ANDRAE & SONS COMPANY, of Milwaukee, has begun a campaign of newspaper advertising which will cover eight cities in the Middle West, from Mason City, Ia., to Green Bay, Wis. The purpose of the series is to develop good will and "sell" to the public an appreciation of the service which the eelctrical jobber performs for the community he serves.

R. S. MITTEN, formerly assistant general sales manager of the Electric Appliance Company of Chicago, has been promoted to be general sales manager, succeeding P. R. Boole, who has become a partner in the Greusel-Quarfot Electric Company of Milwaukee, Wis.

THE MOHAWK ELECTRICAL COMPANY has leased the Cox Building, a six-story structure at 529-531 South Clinton Street, Syracuse, N. Y. It will be utilized by the Mohawk Electrical Company for its wholesale business. The present store on Warren Street will be retained. A. M. Little, president of the company, has announced that acquisition of larger quarters was imperative by the expansion of the concern's business. All labor-saving devices will be installed in the new building.

BINNINGS BROTHERS, Clarksdale, Miss., are moving into their new three-story building and are expanding their stock to include more electrical lines.

THE ERNER ELECTRIC COMPANY of Cleveland recently entertained a group of more than seventy-five of the leading northern Ohio electrical dealers and contractors at a dinner which featured the launching of an Eden washing-machine campaign. The dinner was cooked electrically and served in the company's club room by the young women of the Erner organization. Harry Seiber, vice-president and general manager of the Gillespie Eden Corporation, and Frank B. Rae, Jr., advertising counselor of the Erner Electric Company, were the speakers of the evening. It is announced that similar rallies will inaugurate the various special sales campaigns scheduled by the Erner Electric Company through the coming season.

MICA INSULATOR COMPANY has just completed a new four-story addition to its plant at Schenectady, N. Y., it is announced. The building is of concrete fireproof construction and will add from 50 to 75 per cent to the factory capacity.

THE PIEDMONT ELECTRIC COMPANY, Asheville, N. C., is pushing the idea of ordering goods in unit package quantities. An item in the October issue of "The Peco Contact," house organ of the company, urges this method of purchasing goods as a means for offering customers a better price, greater promptness in filling orders and less chance for error.

Foreign Trade Notes

ELECTRIC LAMPS IN JAPAN.—The electric lamp trade in Japan is a very prosperous one, according to *Reuter's Trade Service*, published in Tokyo. The consumption of electric energy for lighting in 1917 as compared with 1912 showed an increase of 250 per cent. Accordingly the demand for electric lamps has increased steadily and for this year is estimated at 23,000,000 bulbs. The value of bulbs exported rose from 160,284 yen in 1912 to 2,847,187 yen in 1917, when approximately 8,000,000 bulbs were exported. The total for this year is estimated at 14,000,000. Between 80 and 90 per cent of all electric lamps manufactured in Japan are, according to this authority, made by the Tokyo Electric Works, which is a branch of the General Electric Company.

AMERICAN ELECTRICAL TRADE IN CHILE.—From a summary made by the London *Electrician* of the report of the commercial secretary to the British Legation at Santiago, Chile, on the demand in that country for electrical goods, it appears that the part of Great Britain and other exporting nations in this trade is very much smaller than that of the United States. Sixty per cent of the electric lamps are of American manufacture and 30 per cent come from Japan. The American lamps are described in the British report as "not very good" and the Japanese as poorer yet. Electric wire comes mainly from the United States, Japan and Spain and fixtures and battery cells from America. Chile has periods of extreme cold, and electric stoves are becoming more and more popular. Nearly all of these are of American manufacture, though two types of English stoves are on the market. Sales of 4,000 heaters are reported, prices as nearly as can be ascertained varying from $5 to $6 (American) for 600-watt stoves up to $9 and $10 for 2,000-watt stoves. The terms on which they were sold were against acceptance of ninety days' sight drafts, cash, with 2 per cent discount for cash payment.

GOOD PRICES FOR ELECTRIC MOTORS IN UNITED KINGDOM.—At a sale held by direction of the Ministry of Munitions near Glasgow, Scotland, recently, says the *Electrical Review*, there was a keen demand for electric motors and machinery and unusually high prices ruled. Buyers were present in large numbers from all parts of the United Kingdom. Altogether more than £4,000 was realized by the sale of forty-one electric motors, the highest price obtained being £260 for a 35-hp. motor.

ELECTRIC METERS FOR NEW ZEALAND—The *Board of Trade Journal* of Great Britain prints some particulars given in an official report concerning the types of electric meter found suitable to the New Zealand market. It is stated that the maximum-demand instrument is well adapted for hydro-electric systems and would be used more widely if a cheaper and more accurate instrument were available. A serviceable maximum-demand indicator, costing £2 to £4 without wattmeter dial or £3 to £6 with wattmeter dial, would find ready sale. A satisfactory commercial maximum-kva. meter suitable for service on demands of 5 kva. up to 500 kva., graduated for 400, 3,300 and 11,000 volts, is required. So far no suitable instrument for measuring maximum kva. has been available, and consequently it is necessary to take the maximum kilowatts averaged over half an hour and deduce therefrom the maximum kva. from the power factor observed during heavy loads. This system is obviously unsatisfactory if a suitable maximum-kva. or maximum-current measuring instrument is available. The standard frequency at which energy is distributed in New Zealand is 50 cycles.

BIDS FOR ELECTRIFICATION OF CHILEAN RAILWAY.—The Chilean government has called for bids for the electrification of the first zone of the state railways. This zone comprises the line which runs from Valparaiso to Santiago. The bids, which will be received up to March 31, 1921, are of two classes—those proposing to furnish the electric power and those proposing to furnish the actual equipment and rolling stock of the line to be electrified. The Latin American division of the Department of Commerce has booklets containing the conditions on which the bids must be based, and the address of the department from which plans and specifications may be obtained by those who are interested.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

A merchant in India (No. 33,870) invites manufacturers and exporters of electric washing machines to submit literature and terms on these appliances.

An importer in Italy (No. 33,871) desires relations with manufacturers of supplies used in electrical and insulating establishments.

An export agency in America (No. 33,872) with representatives in Australia and Japan desires sole agencies in these countries for vacuum cleaners and other household appliances.

A commercial agent in Brazil (No. 33,888) desires to represent American exporters of electrical goods.

Trade Publications

CABLE JOINTS.—The Standard Underground Cable Company, Pittsburgh, Pa., has issued bulletin No. 740-1, covering cable joints and jointing material.

HOIST CONTROLLERS.—The Allen-Bradley Company, Milwaukee, Wis., has issued a circular No. F-2200, covering small hoist controllers.

INSULATING BRICK.—The Armstrong Cork Company, Pittsburgh, Pa., has recently issued a seventy-two-page book covering "Nonpareil insulating brick," used for the insulation of high temperature industrial equipment such as boilers, furnaces, stills, ovens and kilns.

INSULATED WIRE.—The Standard Underground Cable Company, Pittsburgh, Pa., has recently issued a forty-page bulletin describing its lines of insulated wire.

CONVEYORS.—The Godfrey Conveyor Company, Elkhart, Ind., has ready for distribution a new catalog covering its conveyors and illustrating various installations.

ELECTRIC IRONS.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has recently issued leaflet No. 866, describing the "C-H Electric Tailor's Irons."

New Incorporations

THE CONGRESS ELECTRIC COMPANY, Lynn, Mass., has been incorporated with a capitalization of $100,000 by George O. Willey, M. F. O'Mealey, C. H. Gilmore and J. R. Wellman.

THE APPLE ELECTRICAL MANUFACTURING COMPANY, Dayton, Ohio, has been incorporated by V. G. Apple and H. Apple.

THE GRAYS ELECTRIC LIGHT COMPANY, Grays, Ky., has been incorporated with a capital of $3,000 by J. T. Gray, J. J. Young and S. T. Weidner.

THE JAMES C. GIPE COMPANY of Indianapolis has recently been incorporated at $100,000 to sell electrical appliances and fixtures. The directors are James C. Gipe, Arthur R. Baxter and Wilbur Johnson.

THE EMPIRE WELDING & AUTO REPAIR COMPANY of Wheeling, W. Va., has been incorporated with a capital stock of $5,000 to do a general welding and repair business. Incorporators: W. M. Cole, J. D. Wiles, F. T. Wiles, A. H. Cole and W. E. Cole, all of Wheeling.

THE POWER COMPANY has been incorporated at Charleston, W. Va., to operate anywhere in the state. Capital stock, $25,000. Incorporators: S. W. Bryant, B. C. Eakle, O. L. Hall, J. A. Jones and P. A. Hamrick, all of Clay, W. Va.

THE BLACK RIVER VALLEY POWER CORPORATION of Jefferson County, N. Y., has been incorporated with a capital stock of $10,000. The incorporators are D. M. Anderson, F. L. Carlisle and F. A. Empsall, all of Watertown, N. Y.

THE SMYRNA ELECTRIC LIGHT COMPANY, Smyrna, N. Y., has recently been incorporated with a capital of $25,000 by J. Nelson, L. Nelson and L. J. Nelson of Sherburn, N. Y.

THE UNIVERSAL SYSTEM OF ELECTRIC ALARMS has recently been incorporated with a capital of $500,000 by W. G. Andrew, V. R. Modorn and O. M. S. Greaves, 130 Claremont Avenue, New York.

THE WORDEN ELECTRIC COMPANY of Utica, N. Y., has just been incorporated with a capital of $10,000 by S. A. Hagan, B. C. Madden and L. E. Worden of Whitesboro, N. Y.

THE WAGNER ELECTRIC CORPORATION, Delaware, has filed articles of incorporation, capital $250,000, to manufacture electrical supplies. The incorporators were T. L. Croteau, M. A. Bruce and S. E. Dill.

THE FEDERAL ELECTRIC SAFETY APPLIANCE COMPANY, 317 East Fourteenth Street, New York, has been incorporated with a capital of $100,000 by M. Lyons, W. Lyons and K. Scherer.

C. R. KIERULFF & COMPANY, 757 South Los Angeles Street, Los Angeles, Cal., has been organized to manufacture electrcal specialties. C. R. Kierulff is head of the organization.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

BOSTON, MASS.—The Thomas G. Plant Company has plans under way for extensions and improvements to the power plant at its shoe factory at Jamaica Plain to cost about $50,000.

SPRINGFIELD, MASS.—Bids will be received by the Board of Education, until Nov. 3 for the construction of a junior high school to include a special lighting system on State Street. The cost is estimated at $800,000. H. Sprague, 310 Main Street, is architect.

Middle Atlantic States

ALBANY, N. Y.—The Public Service Commission, Second District, has directed the Murray Electric Light & Power Company of Monticello to extend its line from Centerville or some other convenient point to Mountaindale to supply light, heat and power.

BUFFALO, N. Y.—The Buffalo City Service Corporation, capitalized at $10,000, has been organized to erect an electric plant and distribute electrical energy in Buffalo, Niagara Falls, Lockport, Lackawanna, Batavia, Rochester, Jamestown, Syracuse, Dunkirk and other western New York municipalities. E. C. Randall, Iroquois Building, is interested.

NEW YORK, N. Y.—The United Electric Light & Power Company, 130 East Fifteenth Street, will soon award the contract for the construction of a power house on 134th Street and the East River. The cost is estimated at $4,500,000. T. E. Murray, Inc., 55 Duane Street, is engineer.

PENN YAN, N. Y.—J. T. Andrews & Company plans the installation of two 26-in. Trump hydraulic turbines, total hp. 220, and one 50-hp. hydraulic turbine, belt connected to a 50-kw. Westinghouse alternator and a 3-kw. exciter to replace the present hydraulic turbines; also the installation of two blowers on two boilers for the purpose of burning hard-coal screenings.

CAMDEN, N. J.—The MacAndrews & Forbes Company, Third and Jefferson Streets, contemplates improvements and extensions to its power plant to cost about $150,000 including equipment.

BAKERSTOWN, PA.—The Pittsburgh Cut Flower Company, 116 Seventh Avenue, Pittsburgh, contemplates the erection of a power house to cost about $70,000. Fred Burke is president.

BATH, PA.—The Bath Portland Cement Company contemplates improvements to its power house to cost about $200,000.

PHILADELPHIA, PA.—Bids will be received by the Department of Public Safety, City Hall, until Oct. 28 for furnishing municipal and police telephone service and equipment for the year 1921, to cost about $104,000, and also for furnishing electric lamps and lighting, extinguishing, cleaning and repairing such lamps for lighting the streets, avenues, boulevards and other public places for the year 1921, at a cost of $1,300,000.

BALTIMORE, MD.—Arrangements have been made by the Consolidated Gas, Electric Light & Power Company, Lexington Building, for the removal of buildings at 501-29 East Madison Street, clearing the site for the erection of its proposed electric power plant.

WASHINGTON, D. C.—Bids will be received at the office of J. A. Wetmore, supervising architect, Treasury Department, until Nov. 11 for conduit and wiring and lighting fixtures in the Butler Building.

WASHINGTON, D. C.—Bids will be received by the Commissioner of Indian Affairs, Indian Bureau, Washington, until Oct. 25 for furnishing hardware, electrical supplies, etc.

WASHINGTON, D. C.—Bids will be received by the Chief of Engineers, U. S. A., room 2717 Munitions Buildings, until Nov. 6 for furnishing one switchboard feeder panel. (Adv. No. 50.)

North Central States

DETROIT, MICH.—Bids will be received at the office of the City Bridge Department, Municipal Courts Building, until Oct. 30 for furnshing labor and material, including electrical work, for the construction of the Belle Isle Bridge across the Detroit River, to cost $2,000,000. Esselstyn, Murphy & Hanford, Marquette Building, are engineers.

OXFORD, MICH.—Bids will be received by H. V. Rahm, village clerk, until Nov. 16 for furnishing and installing two 350-gal.-per-minute, 70-lb.-pressure, 30-hp., alternating-current-motor centrifugal domestic service pumps and one 750-gal.-per-minute, 100-lb.-pressure, 75-hp. alternating-current-motor centrifugal fire pump.

ZANESVILLE, OHIO.—The Boston & Ohio Railroad, Market and Second Streets, has preliminary plans under way for the construction of an electric and heating plant at the railroad shops on Lee Street, to cost about $300,000. H. A. Lane, Baltimore, Md., is chief engineer of construction.

HARRODSBURG, KY.—The proposition to install a municipal electric light and power plant and water supply system at a cost of $200,000 will be submitted to the voters at an election to be held Nov. 2. The power plant installation is to consist of three 72 in. x 18 ft. high pressure boilers, one 350 hp. engine, one 200 kw., 2,300 volt, three phase, 60 cycle generator, two 200 hp. engines, direct connected to two 100 kw. generators. Design is in charge of Greeley, Pearce & Hansen, 39 West Adams Street, Chicago, Ill.

RICHMOND, IND.—The Board of Public Works has authorized the purchase of additional equipment for the city lighting plant.

BIRCHWOOD, WIS.—The erection of a new plant at this place by the Wisconsin-Minnesota Light & Power Company, Eau Claire, is contemplated.

MADISON, WIS.—The Eastern Wisconsin Electric Company contemplates making extensions to its transmission lines.

HIBBING, MINN.—The Water & Light Board plans to extend its electric light system. Charles Foster is superintendent of Public Utilities.

ST. PAUL, MINN.—The Diocese of St. Paul is conducting a campaign to raise $5,000,000 for schools and colleges. The building plans include the construction of a power house at the College of St. Thomas, Mernam Park.

IOWA CITY, IA.—Business men contemplate forming a company for the purpose of installing an electric light and power plant at this place.

SIOUX CITY, IA.—The Commissioners of Woodbury County are considering the purchase of equipment to electrify the gravel-pit plant in Kedron Township. R. S. Taylor is county engineer.

MEXICO, MO.—The name of the Mexico Power Company has been changed to the Missouri Utilities Company and the capital stock increased to $1,000,000. The company plans to enlarge its plant and extend the distribution system.

MOUNTAIN GROVE, MO.—The Mountain Grove Creamery Ice & Electric Company has increased its capital from $150,000 to $500,000 and is contemplating the construction of a hydro-electric plant to furnish power to Mountain Grove, Willow Springs, Cabool and other points.

PAXTON, NEB.—Bonds to the amount of $60,000 have been authorized for the construction of a municipal water and light system.

Southern States

BELMONT, N. C.—The Sterling Spinning Company, recently organized with a capital of $800,000, is planning for the installation of considerable electric equipment, including motors, at its proposed local mill. R. C. Riberstein, Charlotte, is engineer.

NEWTON, N. C.—The Blue Ridge Development Company is having estimates prepared by R. E. Wysor, chief engineer, Dublin, Va., for the construction of 106 miles of electric railway from Charlotte to Blowing Rock.

YADKIN, N. C.—The Yadkin Finishing Company, Lexington, plans to install an electric lighting system in the mill village. Melton S. Erlanger is president.

MILNER, GA.—Bonds have been voted for the installation of an electric lighting system at this place.

APALACHICOLA, FLA.—At an election to be held on Oct. 26 an issue of $50,000 in bonds will be submitted to the voters for the erection of a municipal electric light and power plant.

DYERSBURG, TENN. — Bonds to the amount of $25,000 have been voted for the installation of electric light and water systems.

AMARILLO, TEX. — Improvements and additions to the plant of the City Light & Water Company, to cost $100,000, are being made. The installation of considerable new equipment is contemplated.

JACKSONVILLE, TEX.—It is reported that the Jacksonville Electric Light & Ice Company contemplates the erection of a plant to replace the one recently destroyed by fire at a loss of $100,000.

LAPORTE, TEX.—It is reported that the electric light and water plant of the Laporte Light, Water & Ice Company, which was recently destroyed by fire, will be rebuilt at a cost of about $20,000.

Pacific and Mountain States

ASTORIA, ORE.—The North Shore Power & Light Company is considering laying a submarine cable from here to Ilwaco, to cost about $75,000.

PORTLAND, ORE.—Bids will soon be received by the Emanuel Hospital for the construction of a hospital building, power house, etc., on Commercial and Stanton Streets, to cost $300,000.

THE DALLES, ORE.—A modern street-lighting system, covering nine blocks in the main business district, will be installed at a cost of $9,000.

PALO ALTO, CAL.—The Board of Public Works is considering the matter of placing electric wires underground and has directed the city engineer to prepare plans for recommendation to the Council.

SALT LAKE CITY, UTAH.—The Utah Granite & Marble Company of Salt Lake City has filed application with the state engineer for the use of ten second feet of water from the Little Cottonwood Creek in Salt Lake County to develop 270 hp.

SALT LAKE CITY, UTAH.—Permission has been granted to the Utah Power & Light Company by the Public Utilities commission of Utah to extend its lines to Millville and in Juab county.

NAMPA, IDA.—The city officials contemplate the installation of an ornamental street-lighting system.

PLANET, ARIZ. — The Stone Consolidated Copper Company has filed surveys with the state authorities for one of the largest hydro-electric and irrigation projects in the Southwest. Plans include the construction of a dam across the Big Williams fork of the Colorado River to impound a sufficient supply of water to irrigate 276,000 acres of desert land. The storage supply of water also will be used for generating electric power for operating the mines and industries of a big scope of territory.

Canada

HAMILTON, ONT. — The Provincial Board of Health has ordered the erection of an isolation hopsital to cost between $750,000 and $900,000. X-ray and other electrical equipment will be required. J. H. Pratt is chairman.

TORONTO, ONT. — The Dominion Envelope & Carton Company, 150 Duchess Street, is contemplating the construction of a 300 ft. x 400 ft. factory, to cost about $500,000. Considerable electric light and power equipment will be required.

TORONTO, ONT.—The Welland Automobile Storage Battery Company, East 131st Street and St. Clair Avenue, Cleveland, Ohio, has purchased a 3-acre site on Weltshire Avenue and plans the erection of a storage-battery plant to cost $500,000.

WINDSOR, ONT.—The Board of Education plans to erect a school to include an electrically operated ventilation system. Cost is estimated at $550,000.

1,353,748. ELECTRICAL CONNECTION; Ellesworth A. Hawthorne, Bridgeport, Conn. App. filed Feb. 14, 1918. Socket.

1,353,783. DIRECTION INDICATOR; John W. Patterson, Memphis, Tenn. App. filed March 14, 1917. For automobiles.

1,353,815. CONTROLLING AND REGULATING APPARATUS; Friedrich W. Meyer, Milwaukee, Wis. App. filed Jan. 13, 1917. For speed or voltage.

(Issued Oct. 12, 1920)

1,355,116. ELECTROLYTIC CELL; Herbert I. Allen, Portland, Me. App. filed Feb. 5, 1918. Electrolysis of sodium chloride.

1,355,124. ELECTRIC WELDING METHOD AND APPARATUS; Alexander Churchward, New York, N. Y. App. filed Feb. 18, 1920. Improved current control.

1,355,126. X-RAY TUBE; William D. Coolidge, Schenectady, N. Y. App. filed Dec. 16, 1916.

1,355,147. NETWORK-SELECTING DEVICE; Oliver B. Jacobs, East Orange, N. J. App. filed May 17, 1919. Automatic selection of trunk.

1,355,153. ELECTRICITY METER OF THE INDUCTION-MOTOR TYPE FOR THREE-PHASE ALTERNATING CURRENT; Absalom Larsen, Gentofte, Copenhagen, Denmark. App. filed March 10, 1919. Simplified.

1,355,163. HEAD CONSTRUCTION FOR ELECTRIC LAMPS; Morris Ozlek, Philadelphia, Pa. App. filed Sept. 17, 1917. Shade easily removed.

1,355,164. CLUSTER TOP FOR LAMPS; Morris Ozlek, Philadelphia, Pa. App. filed Feb. 26, 1920. Easy connection to conduit wires.

1,355,191. SIGNAL SYSTEM FOR TELEPHONES; Kizo Tsukamoto, Tokyo, Japan. App. filed June 12, 1919. Long-distance.

1,355,259. SIGNAL SET; Frank B. Perry, Newton Center, Mass. App. filed Feb. 23, 1918. Telegrahic instructor.

1,355,283. MOTOR; William Sparks, Jackson, Mich. App. filed March 16, 1917. For signal horn.

Record of Electrical Patents

Notes on United States Patents

1,355,301. ELECTRICAL RECEPTACLE; Reuben B. Benjamin, Chicago, Ill. App. filed May 29, 1917. Screw socket.

1,355,334. ELECTRIC ARC LAMP; Haydn T. Harrison, Westminster, England. App. filed Feb. 4, 1919. Carbons kept cool.

1,355,347. POLE CONSTRUCTION; Soren H. Mortensen, Milwaukee, Wis. App. filed July 18, 1918. Pole piece mitered to yoke.

1,355,382. THERMO-THERAPEUTIC APPLIANCE; Aaron Blume, New York, N. Y. App. filed Jan. 16, 1919. Heated shoe.

1,355,433. PROCESS OF MAKING BATTERY SEPARATORS; Harry S. Stronach, Oak Park, Ill. App. filed June 5, 1920. Wood.

1,355,447. APPARATUS FOR CONTROLLING THE OPERATION OF WORK PRODUCERS OPERATING IN PARALLEL; Frederic R. C. Boyd, Boston, Mass. App. filed April 21, 1916. For controlling output of alternating-current generators.

1,355,448. INDICATING AND RECORDING INSTRUMENT; Richard P. Brown and Charles P. Frey, Philadelphia, Pa. App. filed Dec. 9, 1919. For temperature or pressure.

1,355,475. SYSTEM OF CONTROL; Rudolf E. Hellmund, Swissvale, Pa. App. filed March 14, 1917. For regenerative motors.

1,355,477. MEANS FOR SEPARATNG MIXTURES; Sylvester S. Howell, Chicago, Ill. App. filed Nov. 4, 1918. Separates chaff from grain.

1,355,515. ELECTRICAL MEASURING INSTRUMENT; Benjamin H. Smith, Turtle Creek, Pa. App. filed July 19, 1917. Direct-current watt-hour meter.

1,355,524. SPRING MECHANISM FOR VIBRATING RECTIFIERS; Alfred L. Atherton, Wilkinsburg, Pa. App. filed Dec. 29, 1915. For variable frequencies.

1,355,529. VACUUM-TYPE CONVERTER; Wilfred T. Birdsall, Montclair, N. J. App. filed Oct. 9, 1915. Free from short-circuiting.

1,355,549. SYSTEM OF CONTROL; Ralph E. Ferris, Swissvale, Pa. App. filed July 19, 1917. Control during motor regeneration.

1,355,551. MEANS FOR AND METHOD OF PRODUCING ETHERIC DISTURBANCES; Charles Le G. Portescue, Pittsburgh, Pa. App. filed April 5, 1917. Vacuum tubes.

1,355,575. TROLLEY-WHEEL; John E. Sederholm, St. Paul, Minn. App. filed Oct. 6, 1919. For cranes.

1,355,594. TELEPHONE-EXCHANGE SYSTEM; Bert G. Dunham, Hawthorne, N. J. App. filed Dec. 27, 1918. Rotary line switch.

1,355,605. TROLLEY-WIRE SUPPORT; Walter W. Hunzicker, Mansfield, Ohio. App. filed Nov. 6, 1918. Clamped by single operation.

1,355,614. TROLLEY-WIRE CLAMP; Samuel S. Matthes, Mansfield, Ohio. App. filed Dec. 28, 1918. Readily removable.

1,355,622. MAGNETIC INTENSIFIER; Charles B. Russell, Brockton, Mass. App. filed Aug. 15, 1919. Reciprocating motor of long stroke.

1,355,634. TELEPHONE-EXCHANGE SYSTEM; Samuel B. Williams, Jr., Brooklyn, N. Y. App. filed Dec. 27, 1918. Semi-mechanical private branch.

1,355,635. TELEPHONE-EXCHANGE SYSTEM; Samuel B. Williams, Jr. App. filed Dec. 27, 1918. Semi-mechanical.

1,355,644. ELECTRIC WATER HEATER; Leon H. Beaufet, Montreal, Quebec, Canada. App. filed May 20, 1919. Heated in passage.

1,355,672. ELECTRIC GENERATING PLANT; George W. Howden, Holly, Mich. App. filed April 12, 1916. Windmill driven.